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EDITORIAL

Greetings from IAARHIES and the Conference organizing Committee!

At the very outset, we extend a warm welcome to all our distinguished guests, speakers and the participants who have joined us for this International Conference in London, United Kingdom.

We are happy to receive the research papers from all part of the world and some of the best papers published in this proceedings. The current edition of the proceedings brings out the various research papers from diverse area of Business, Economics, Management, Engineering, Technology, Science and Humanities. The IAARHIES conferences are an attempt to provide a platform to the researchers, educators and professionals to present their innovative thoughts and discoveries and to explore future trends and applications in the field of Engineering and Technology. However, this conference will also provide a forum for dissemination of knowledge on both theoretical and applied research on the above said area with an ultimate aim to bridge the gap between these coherent disciplines of knowledge. Our final goal is to make the Conference proceedings useful and guiding factor to audiences involved in research in these areas, as well as to those involved in design, implementation and operation, to achieve their respective goals.

We once again are thankful to all the delegates participating in this event in London, UK. We are sure about the contributions to be added by the participating authors to the research community and rapidly growing field of education throughout the globe. We are also thankful to all the International advisory members and reviewers for making this event a successful one.

We are specially thankful to **Dr. Farah Mohammadi,** Department of Electrical and Computer Engineering, Ryerson University, Toronto, ON, M5B 2K3, Canada **and Professor Mincheol Kim,** Department of Management Information Systems, Jeju National University, Jeju City, South Korea for joining and chairing the IAARHIES event in London, UK. We wish them all the success in life ahead.

"Let your mind start a journey through a strange new world,
Leave all thoughts of the world you knew before,
Let your soul take you where you long to be,
Close your eyes, let your spirit start to soar and you'll live as you've never lived before."

-Erich Fromm

Sandeep Kumar
(Chairman, SAR)

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(Gen. Secretary, SAR)

CONTENTS

Supply Chain Network Design for Food Grains

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Abstract. Increasing environmental and social concerns are forcing companies to take a fresh view of the impact of supply chain operations on environment and society when designing a supply chain. A challenging task in today's food industry is the distribution of high quality food items throughout the food supply chain. Improper storage and unwanted transportation are the major hurdles in food supply chain and can be tackled by making dynamic storage facility location decisions with the distribution network. Since food supply chain in India is one of the biggest supply chains in the world, the companies should also consider environmental impact caused by the supply chain. This project proposes a Multi Objective optimization model by integrating sustainability in decision-making, on distribution in a food supply chain network (SCN). A Multi-Objective Mixed-Integer Linear Programming (MOMILP) model between overall cost and environmental impact caused by the SCN is formulated for the problem. The goal of MOMILP is to determine the pareto solutions for overall cost and environmental impact caused by the supply chain. This is solved by using GAMS with CPLEX as third party solver. The outcomes of the project are pareto solutions for overall cost and environmental impact, facilities to be operated and the amount to be transferred toeach warehouse during the time horizon.

1 Introduction

There are many ways to define supply chain; of assets, information, processes that provide supply. Links of the chain are various inter connected organizations, right from the raw material suppliers to the consumer. In order to optimize right quality, reasonable inventory costs and to get rid of herds of suppliers to an organization, sophisticated supply chain strategies are essential. Those strategies are often termed as supply chain management. Food Supply Chain (FSC) is somewhat different from the traditional Supply Chain (SC) because of the perishability nature of the products. FSC has experienced a great deal of technological advancements over the last decade for efficient distribution of the food products.

India is one of the world's largest producers of rice, accounting for 20% of all world rice production. Though the production rate of rice in India increases every year, India has failed to meet the demand of its population. Since plenty of food is wasted in India, usually because of a lack of proper storage and transport as food is moved from the farm to the market. According to some estimates, nearly 40% of all fresh food produced in India perishes before it can get to customers. This means lost income for small farmers and higher prices for consumers. This problem can be overcome by having proper storage facilities for the food products.

At the same time, longer transportation distances lead to increased air pollution and green house gas emissions which affect human health and contribute to global warming. Today's consumers also consider criteria such as quality, safety, and environmental conformity to make purchase decisions; often, they are willing to pay more for sustainable products. Hence, there is a need to efficiently design eco-friendly supply chains, to improve environmental and social aspects of the triple bottom line concept. Network design is a logical place to start when looking for a sustainable supply chain network design (SCND).

Managing the facilities has received significant attention in the last decade especially in global emerging markets. The main focus of the project in this area is to determine the number and location facilities and to optimize the amount of products delivered to lower stages at each level. Very often, it is assumed that facilities have sufficiently large capacities to meet even the largest demands, in contrast to those where capacities are limited, and quite a few deterministic models are proposed for solving such problems. On the other hand, there are some models which

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include uncertainty. This model examines the strategic decision of number of facilities to be operated and their location considering environmental impact caused by transportation. This problem is formulated as a Multi-Objective MixedInteger Linear Programming (MOMILP) problem. MultiObjective Mathematical Programming (MOMP) methods can be classified as

- a priori,
- interactive and
- a posteriori.

Although the a priori methods are the most popular, the interactive and the a posteriori methods convey much more information to the decision maker. In a priori methods the decision maker expresses his/her preferences before the solution process (e.g. setting goals or weights to the objective functions). In the interactive methods phases of dialogue with the decision maker are interchanged with phases of calculation and the process usually converges, after a few iterations, to the most preferred solution. But, a posteriori (or generation) methods give the whole picture (i.e. the Pareto set) to the decision maker, thus reinforcing the final decision.

2 Literature Review

2.1 Food Supply Chain Network

Hanne Ala-Harja et al., (2014) analyse cases from the food industry, mainly order-picking, transportation, warehousing, and distribution aspects from the sustainability point of view. Three case examples of decisions in supply chain design in the food industry are considered. The results show dependencies between performance measures. Finally, a framework of decisions and their impact on performance is presented.

Philip Beske et al., (2013) discuss about the food industry according to SSCM and Dynamic Capabilities criteria and offer insights into the strategies used in that business market. The results show that sustainability practices and DCs in the supply chain are used among others to enhance traceability and tracking and to fulfill customer demands.

Rong et al., (2011) explain about the complexity of managing a FSCN due to many specific product and process characteristics. Food supply chain continually changes systems and involves many participants such as food procurement and manufacturing companies, wholesale and distribution firms, brokers, food service firms and restaurants, and retail grocery firms. Hamid Ashfari et al., (2013) propose a stochastic mixed integer linear programming (SMILP) model to optimize the location and size of facilities and service centres in integrated forward and reverse streams under uncertainty for automobile industry.

K. Govindan et al., (2014) propose a multi-objective particle swarm optimization for optimizing the location of the warehouses to reduce costs caused by carbon footprint and greenhouse gas emissions throughout the network whereas Sahar Validi et al., (2014) proposes a multi-objective particle swarm optimization with time windows for reducing carbon footprint. Zarei et al., (2011) propose a single-level food supply chain network to increase food supply chain efficiency. Herminia I. Calvete et al., (2014) uses Genetic algorithm for solving Bi-level Mixed Integer Optimization Problem. P. Amorim et al., (2013) suggest Multi objective Genetic Algorithm to minimize logistics cost by maximizing freshness whereas M. Soysal et al., (2013) proposes a Multi- Objective Linear Programming in Cplex to minimize total logistics cost.

Dwi Agustina et al., (2014) use Mixed-Integer Linear Program in Cplex to reduce inventory holding and the time products spend in the supply chain.

2.2 General Algebraic Modelling System(GAMS)

GAMS was developed to improve modeling and programming (Tutorial by E. Rosenthal) by:

- Providing a high-level language for the compact representation of large and complex models
- Allowing changes to be made in model specifications simply and safely
- Allowing unambiguous statements of algebraic relationships
- Permitting model descriptions that are independent of solution algorithms

GAMS contain an Integrated Development Environment (IDE), and is connected to third party optimization solvers. Models are described in concise algebraic statements which are easy to read. Some solvers among the third party solvers are Cplex, GUROBI, MINOS, BONMIN, COIN

Solvers, MOSEK and XPRESS. And the present model is solved using COIN CBC solver.

2.3 Research Gap

From the above research insights, despite the growing body of literature on Food Supply Chain, efforts to synthesize the overall state of art of research on FSC have so far been rather limited.

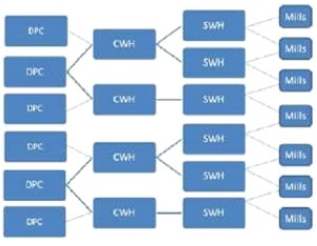
Past researches have mainly on efficient vehicle routing for the given network with existing facilities to reduce logistics cost and the environmental impact caused by the green house gases like CO2 emissions. The researches on efficient inventory management have concentrated only on reduction of inventory cost by managing the existing inventories to prevent stagnation of food products. Some researches have considered perishability factor of food products into account for avoiding outdated inventories. These researches have not concentrated on the improper storage of the food products due to unavailability of storage facilities and the cost incurred by the wasted products. This project focuses on flexibility in number and location of warehouses considering environmental impact caused by the supply chain.

3 Methodology

This project is designed to find the optimal number of warehouses and the amount to be transferred to lower level at each stage based on various factors. The factors to be considered are

- Fixed cost,
- Operating cost,
- Transportation cost,
- Amount to be transferred,
- Capacity of the warehouses,
- Demand of the end point
- Environmental impact per product

3.1 Conceptual Model



3.2 Mathematical Model

Sets

K - The set of Direct Procurement Centres, indexed by 'k'

J - The set of Central Warehouses, indexed by 'j' L - The set of State Warehouses, indexed by 'l' t - The set of time periods

Parameters

fc_j^t - Fixed cost of the central warehouses at time period 't'

oc_j^t - Operating cost of the central warehouses at time period 't'

s_k^t - Supply from the Direct Procurement Centres at period 't' k_j^t - Capacity of Central Warehouses at period 't' d_{2l}^t - Demand of the State Warehouses at period 't' d_k^t - Distance between DPC and CWH dd_i^t - Distance between SWH and CWH c - Transportation cost per unit distance per unit product ic - Inventory cost per product q - Environmental impact per product f - Minimum utilization percentage capacity of the warehouse

Decision Variable x_k^{jt} - Amount of products to be transferred from 'k' to 'j' $x1_{jl}^t$ - Amount of products to be transferred from 'j' to 'l' y_j^t - Inventory at warehouse 'j' at period 't' a_j^t - 1 if facility is open, else 0

3.3 Mathematical Formulation

Minimize

$$z1 = \sum_j \sum_k \sum_t dkj \times xkjt \times c + \sum_j \sum_t (fcjt \times ajt + oc_j^t \times a_j^t + y_j^t \times ic) + \sum_j \sum_i \sum_t dd_{ij} \times x_{1jl}^t \times c \quad (1)$$

$$z2 = \sum_k \sum_j \sum_t qkj \times xkjt + \sum_j \sum_l \sum_t qjl \times x1tjl \quad (2)$$

Such that

$$\sum_j x_{kj}^t = s_k^t \quad \forall k, t \quad (3)$$

$$\sum_j x_{kj}^t \le a_j^t \times k_j^t \quad \forall j, t \quad (4)$$

$$\sum_j x_{jl}^t = d_{2l}^t \quad \forall j, t \quad (5)$$

$$\sum_j x1tjl \le ajt \times kjt \quad \forall j, t \quad (6)$$

$$\sum_j k_j^t \ge \sum_l d_{2l}^t \quad \forall t \quad (7)$$

$$\sum_j x1tjl + yjt \le \sum_k xkjt \quad \forall j, t = 1 \quad (8)$$

$$\sum_j x_{1jl}^t + y_j^t \le \sum_k x_{kj}^t + y_j^{t-1} \quad \forall j, t = 1 \quad (9)$$

$$\sum_j x_{1jl}^t + y_j^{t-1} \ge f \times k_j^t \times a_j^t \quad \forall j, t > 1 \quad (10)$$

$$a_j^t \in \{0,1\} \quad (11)$$

The objective function (1) is the overall cost of the SCN. The first term represents the expected transportation cost for transferring food products from DPC to CWH. The second term represent the total cost of operating the

facilities including fixed cost, operating cost and inventory cost. Finally, the last term is the transportation cost for transferring food products from CWH to SWH.

The objective function (2) is the environmental impact of the SCN. The term represents the environmental impact caused by transportation of products from DPCs to CWHs and the second term represents the impact caused by transportation of products from CWHs to SWHs. Constraint set (3) implies the amount shipped from DPCs to CWHs will be equal to the amount procured. In addition, it ensures that all the procured products are shipped to the CWHs. Constraint set (4) explains the amount transferred from DPCs to any CWH will always be less than the capacity of that particular CWH. Constraint set (5) implies the amount shipped from CWHs to SWHs will be equal to the demand of the consumers. Constraint set (6) implies that the amount transferred from CWHs to any SWH will always be less than the capacity of that particular SWH. Constraint set (7) Capacity of the CWHs should be more than the demand. Constraint set (8) implies that the amount transferred from any CWH to SWHs and the inventory held at the CWH will give the 11
11

amount to be obtained from the DPCs by the CWH in first time period. Constraint set (9) explains the amount shipped to any CWH will be dependent on the inventory held in the previous period except first period. Constraint set (10) restricts the opening of the warehouse till 60% and constraint sets (11) place binary restrictions on variable ajt, which decides whether to open or close a warehouse in a time horizon.

3.4 Multi Objective Mixed Integer Linear Programming

Multi-objective optimization is also known as multiobjective programming, vector optimization, multicriteria optimization, multi-attribute optimization or Pareto optimization. It is an area of multiple criteria decision making that is concerned with mathematical optimization problems involving more than one objective function to be optimized simultaneously. Minimizing cost while maximizing comfort while buying a car is an example of a multi-objective optimization problem involving two objectives. In practical problems, there can be more than two objectives. The goal may be to find a representative set of Pareto optimal solutions, and/or quantify the trade-offs in satisfying the different objectives, and/or finding a single solution that satisfies the subjective preferences of a human decision maker (DM).

Multi-Objective Mixed-Integer Linear Programming (MOMILP) methods can be classified as a priori, interactive and a posteriori. In a priori methods, preference information is first asked from the DM and then a solution best satisfying these preferences is found. In a posteriori methods, a representative set of Pareto optimal solutions is first found and then the DM must choose one of them. In interactive methods, the decision maker is allowed to iteratively search for the most preferred solution. In each iteration of the interactive method, the DM is shown Pareto optimal solution(s) and describes how the solution(s) could be improved. Multi-Objective Mixed Integer Linear Programming has been applied in many fields of science, including engineering, economics and logistics, where optimal decisions need to be taken in the presence of trade-offs between two or more conflicting objectives.

3.4 Modelling using GAMS

GAMS is helpful in solving mathematical models, especially multi objective models, different types of models like MIP, MINLP, QCP, etc. can be solved in GAMS. It has different solvers for each type. Method of solving change from solver to solver. Here the MOMILP is modeled with GAMS Software and solved by using Cplex solver. COIN CBC solver takes much time for getting optimal value for few problems, Cplex can be used to solve those problems.

3 Results and Discussion

4.1 Numerical Example

In this research, a real time problem is illustrated, in which a food supply chain consists of Production areas, Central

warehouse and State warehouse. The DPCs procure goods from farmers of the corresponding areas, which is then consolidated and is supplied to the central warehouses. The procured goods are then stored in the central warehouses. The state warehouses purchases the goods from the central warehouses as per the demand of the corresponding areas they serve. Since the supply of the food products varies every year based on the production, there is a need for flexibility in the number of warehouses and its location. The number and the location can be optimized by optimizing the overall cost incurred in handling the product from DPCs to SWHs. Fixed cost for opening the warehouse, operating cost for the opened warehouse and transportation cost for transferring procured products from the DPCs to CWHs and from CWHs to SWHs are considered in optimizing the location of the warehouse. The amount to be delivered to the lower stages of each level is also optimized to reduce unwanted transportation.

In this problem, the capacities of both the CWH and SWH, the supply of the DPCs, the demand of the SWHs, the distance between DPCs and the CWHs and the distance between the SWHs and the CWHs are considered as input.

3.4 Results

Result will be consisting of pareto solutions for overall cost

Table 1. Overall cost for different minimum utilization percentage

Minimum Utilization Percentage	Overall Costs
0.5	49441794638.000
0.6	4956108174.000
0.65	49438858276.000
0.7	49463291342.000

5 Conclusion

The aim of this project is to design a multi-period, singleproduct SCD model. This model examines the trade-off between the overall cost and environmental impact caused by the supply chain. It depends on the decision maker to decide between trade-off values of the optimal solutions. This model also examines the strategic decision of facility selection and the tactical decision of capacity allocation among facilities. Moreover, we consider the location of the warehouses for reducing unwanted transportation. This model analyses the minimum utilization percentage of a warehouse and determines 65% as the optimal minimum utilization percentage of a warehouse.

Multi-Objective Mixed-Integer Linear Programming model is formulated for the problem. We have considered data of three time periods in this problem. These have been solved using GAMS with Cplex as third party solver.

The outcomes of the problem are pareto solutions for overall cost and environmental impact caused by the supply chain, facilities to be operated, amount to be transferred to the lower stages at each level during time horizon to minimize the total expected cost. Inference of the project is to show how the flexibilities in the facilities can be helpful in reducing the total expected cost. This is well explained in results and discussions.

This study is intended to build a multi period and multi product model for designing supply network and to consider wastage cost as future work.

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New Application of Thermography as Detection Modality for Tumorous Breast

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ABSTRACT

A simplified one-dimensional bioheat transfer model of the spherical living tissues in the steady state has been set up for application in heat transfer studies based on the Pennes' bioheat transfer equation and its corresponding analytical solution by using Bessel's equation has been derived in this paper. The obtained analytical solution is applied to analyze the effects of the metabolic heat generation, the tissue thermal conductivity, the blood perfusion and the coefficient of heat transfer on the temperature distribution in living tissues. A further parametric analysis has been made to reveal the tumour size, hyperactivity rate and location based on the temperature distribution profile. The results show that the derived analytic solution is useful to easily and accurately study the thermal behaviour of the biological system, and can be extended to thermal behaviour research of biological system, thermal parameter measurements, temperature field reconstruction and clinical treatment.

Keywords: Bioheat transfer, Pennes' equation, Analytical solution, Bessel functions, Tumour.

1. INTRODUCTION

In live biological body the spatial temperature distribution in tissues plays a vital role in many physiological processes. Recent advancement in the bioheat transfer research field has paved a key foundation in hyperthermia cancer therapy, thermal diagnosis, cryogenic surgery etc. [1, 2]. The quantitative and accurate analysis of bioheat transfer is to effectively understand and model the heat transfer mechanism of the biological system.

The complexity underlying in the precise thermal analysis process of living tissues remains not only for its heterogeneity and anisotropy but also for conduction, convection, and radiation heat flow, cell's metabolism, and blood perfusion etc. Accordingly, it is very difficult to build precise and exact thermal models and most of the proposed bioheat equations are very complicated thus complex but not unattainable to solve analytically.

The analytical solutions of these equations have important significance in the study of bioheat transfer because they reflect actual physical feature of the equations and can be used as standards to verify the corresponding numerical results and as a proof to the reasonability of in-vitro mode analysis. Various techniques have been proposed to obtain analytical solutions of these equations. The estimation of temperature distribution in biological tissues at steady-state in one dimensional Cartesian coordinate was presented by Zhou et al. [3]. The same analysis in cylindrical geometry with showing the parameters effect in spatial temperature distribution was depicted in [4]. Shih et al. [5] presented and discussed the solution for the models of living tissue with applying sinusoidal heat flux on skin surface. For local magnetic hyperthermia, the time dependent analytical analysis of bioheat equation was performed by Gutierrez [6] in the spherical system to estimate the localized and concentrated heat required for the ablation of the cancerous cells. In this paper, the derivation of the general analytic solution for one-dimensional steady-state model of the spherical living tissue is conducted by adopting the Pennes' bioheat transfer equation [7-9]. The fundamental Pennes' equation and its solution are presented in the following two consecutive sections. The section 2 is devoted to

present the analytic solution methodology. The application of obtained solution to the tissue's internal temperature distribution and the thermal effect of tumours are described in section 3

2. METHODS

Pennes, in 1948, proposed a model considering cell's metabolism and blood perfusion effects on temperature distribution in live biological bodies, at steady-state condition which is written in one-dimensional spherical coordinate system as:

$$\frac{1}{r^2}\frac{d}{dr}\left(r^2\frac{dT}{dr}\right)+\frac{w_b c_b}{k}\left(T_a-T\right)+\frac{q_m}{k}=0 \quad (1)$$

where, w_b, c_b are the perfusion rate per unit volume and specific heat of blood, respectively; k is the thermal conductivity of tissue; q_m is the metabolic heat generation per unit volume; T_a and T represent the artier blood and tissue temperature, respectively.

For axially symmetrical model the boundary conditions are described as:

$$r=0,\ \frac{dT}{dr}=0 \qquad (2a)$$

and

$$r=R,\ -k\frac{dT}{dr}=h_a\left(T-T_e\right) \qquad (2b)$$

Where, R is the radius of the concerned tissue; h_a is the heat exchange coefficient which accounts for both the convection and radiation heat loss on the tissue surface; T_e is the ambient temperature.

To obtain dimensionless heat equation and boundary conditions the following characteristics quantities are proposed:

$$r^*=\frac{r}{R},\quad T^*=\frac{T-T_e}{T_a-T_e} \qquad (3)$$

Substituting (3) into (1) lead to:

$$\frac{1}{r^{*2}}\frac{d}{dr^*}\left(r^{*2}\frac{dT^*}{dr^*}\right)+\frac{w_b c_b R^2}{k}\left(1-T^*\right)+\frac{q_m R^2}{k\left(T_a-T_e\right)}=0 \qquad (4)$$

and the dimensionless boundary conditions are:

$$r^*=0,\ \frac{dT^*}{dr^*}=0 \qquad (5a)$$

and

$$r^*=1,\ \frac{dT^*}{dr^*}=-\frac{h_a R}{k}T^* \qquad (5b)$$

Here, the dimensionless parameters and variables are defined as:

$\frac{w_b c_b R^2}{k}=w^*$, $\frac{q_m R^2}{k\left(T_a-T_e\right)}=q_m{}^*$ and $\frac{h_a R}{k}=h_a{}^*$

Therefore, the dimensionless governing equation is:

$$\frac{1}{r^{*2}}\frac{d}{dr^*}\left(r^{*2}\frac{dT^*}{dr^*}\right)-w_b{}^*T^*+w_b{}^*+q_m{}^*=0 \quad (6)$$

and the boundary conditions are:

$$r^*=0,\ \frac{dT^*}{dr^*}=0 \qquad (7a)$$

and

$$r^*=1,\ \frac{dT^*}{dr^*}=-h_a{}^*T^* \qquad (7b)$$

By dropping the superscripts * and letting $w_b{}^*=\alpha$ and $w_b{}^*+q_m{}^*=\beta$, the equation (4) becomes:

$$\frac{1}{r^2}\frac{d}{dr}\left(r^2\frac{dT}{dr}\right)-\alpha T+\beta=0 \qquad (8)$$

To solve the equation (8), let's assume $T=\frac{H_{(r)}}{\sqrt{r}}$ and by differentiating we obtain,

$$\frac{dT}{dr}=r^{-1/2}H'-\frac{1}{2}r^{-3/2}H \qquad (9)$$

Substituting (9) in (8) we get,

$$\frac{1}{r^2}\frac{d}{dr}\left(r^{3/2}H'-\frac{1}{2}r^{1/2}H\right)-\alpha r^{-1/2}H=-\beta \quad (10)$$

The homogeneous equation is:

$$\frac{1}{r^2}\frac{d}{dr}\left(r^{3/2}H'-\frac{1}{2}r^{1/2}H\right)-\alpha r^{-1/2}H=0 \quad (11)$$

After simplifying and multiplying by $r^{1/2}$ we get

$$r^2H''+rH'-\left(\alpha r^2+\left(\frac{1}{2}\right)^2\right)H=0 \quad (12)$$

The equation (12) is modified Bessel equation of half kind and therefore the solution is:

$$H=C_1I_{1/2}\left(\sqrt{\alpha}r\right)+C_2K_{1/2}\left(\sqrt{\alpha}r\right) \quad (13)$$

According to the characteristics of Bessel's equation, we have, $C_2=0$. Therefore, the solution to (13) is:

$$H=C_1I_{1/2}\left(\sqrt{\alpha}r\right) \qquad (14)$$

The exact solution in terms of $T(r)$ is:

$$T = C_1 \frac{I_{1/2}\left(\sqrt{\alpha} r\right)}{\sqrt{r}} + T_p \qquad (15)$$

where, T_p is the particular solution and $T_p = \frac{\beta}{\alpha}$.

Therefore, the temperature expression considering the superscript * again:

$$T^*\left(r^*\right) = C_1 \frac{I_{1/2}\left(\sqrt{\alpha} r^*\right)}{\sqrt{r^*}} + \frac{\beta}{\alpha} \qquad (16)$$

Considering the boundary condition of (7b), some simple derivations lead to:

$$\frac{dT^*}{dr^*} = C_1 \left(-\frac{I_{1/2}\left(\sqrt{\alpha} r^*\right)}{2r^* \sqrt{r^*}} + \frac{\sqrt{\alpha} I_{3/2}\left(\sqrt{\alpha} r^*\right) + \frac{1}{2r^*} I_{1/2}\left(\sqrt{\alpha} r^*\right)}{\sqrt{r^*}} \right) \qquad (17)$$

$$C_1 = -\frac{h_a^* T^*}{\left(-0.5\, I_{1/2}\left(\sqrt{\alpha}\right) + \sqrt{\alpha} I_{3/2}\left(\sqrt{\alpha}\right) + 0.5\, I_{1/2}\left(\sqrt{\alpha}\right)\right)} \qquad (18)$$

$$T^* = -\frac{h_a^* T^*}{\sqrt{\alpha} I_{3/2}\left(\sqrt{\alpha}\right)} \frac{I_{1/2}\left(\sqrt{\alpha} r^*\right)}{\sqrt{r^*}} + \frac{\beta}{\alpha} \qquad (19)$$

$$T = T_e + \frac{\beta}{\alpha} \left(\frac{1}{1 + \frac{h_a^* I_{1/2}\left(\sqrt{\alpha} r^*\right)}{\sqrt{\alpha} r^* I_{3/2}\left(\sqrt{\alpha} r^*\right)}} \right) \left(T_a - T_e\right) \qquad (20)$$

3. RESULTS

By applying the obtained analytic solution in (20), the interior steady-state temperature of living tissues in a body organ, which could be approximated as spherical in shape (for example- female breast, buttock), in the resting person can be easily and accurately obtained, which can facilitate the further analysis of the heat transfer characteristics of living tissues embedding hyperactive nodule.

The effect of major thermal parameters on the temperature distribution of spherical living tissues are discussed, wherein, the typical parameter values, chosen for theoretical analysis are presented in Table 1.

Table 1: Parameter values used in theoretical analysis

Parameter	Value and Unit
w_b	3 $kg/(.s\, m^3)$
c_b	3850 $J/(kg.{}^oC)$
k	0.48 $W/(m.{}^oC)$
h_A	8.77 $W/(m^2.{}^oC)$
q_m	1085 W/m^3
T_a	37 ^oC
T_e	25 ^oC

The upshot of the metabolic heat generation, the heat exchange coefficient, the blood perfusion, and the tissue thermal conductivity on temperature profile are shown in Figs. 1 to 4, respectively.

In Fig. 1, the family of graphs shows that changes in metabolic heat generation elevates the inner tissue temperature magnitudes but maintains an almost constant slope in the temperature flow path to the boundary regardless the metabolic rate.

The Fig. 2 asserts that the higher the coefficient of heat transfer, the lower the temperature near the boundary of the body. This ambient dependence phenomenon in thermal distribution of biological body produces a distinguishable elevation in skin temperature and is a tool for analyzing benign stage tumour.

The effect of blood perfusion rates on the temperature distribution is illustrated in Fig. 3. The curves indicate that the gradient of the temperature variation in redial direction decreases with increasing blood perfusion, which is a result of higher rate of heat distribution caused by the blood perfusion. Moreover, the differences between the effects of the higher blood perfusion rates on temperature distribution become smaller.

The simulation results presented in Fig. 4 shows the changes in the values of the tissue thermal conductivity

has effect on body heat transfer capacity.

The effect of tumour, located at the center of the spherical model (see Fig 5) surrounded by sound tissues, on the thermal distribution of body is presented in the Fig.6. The incremental temperature distribution of a tumour of radius 5mm at depth 4 cm which has 2- 5 times higher hyperactivity than average sound tissue is presented.

A center tumour of different size with a constant metabolism of 5 times higher than healthy tissues is presented in Fig. 7. This figure shows that radius has no effect on the temperature established at the centre of the nodule.

The resultant thermal profile of a tumour at centered origin embedded in healthy tissues is presented in Figs. 8 and 9 for different tumour sizes and metabolism rates, respectively.

The Fig. 8 concludes that the maximum raise in the temperature at the model origin does not depend on the size of the tumour. The size has effect on the temperature magnitude at the boundary only. While the intensity influences both the temperature grow at origin and amount of temperature that reach to the boundary, it is evident from Fig 9.

If the tumour is not located at a depth of 2 cm rather than being at the model origin, as shown in Fig. 10, the temperature flow in the outward direction for different tumour sizes and metabolism rates are presented in Figs. 11 and 12, respectively.

It can be seen from Fig. 11 that an abrupt change in temperature profile at the tumour position makes a constant vertex at 46°C for all the values of radius. The analysis also shows that the increasing hyperactivity rate of tumour tissues increases both the temperature magnitude at the tumour location and at boundary which is conveyed by Fig. 12.

4. Discussion

In this paper, the steady-state bioheat transfer model of the spherical living tissues has been analyzed based on Pennes' equation, and the corresponding equation has been solved in one-dimensional domain. The Bessel's equation involving analytical solution is obtained in this study is useful for describing the tissue temperature distribution in radial direction.

Taking account of the parametric studies, the thermal conductivity and blood perfusion effects are neglected for further analysis in case of tumours, though the thermal conductivity of the tumour cells is somewhat increase from that of sound tissue but it plays an insignificant effect on temperature profile and likewise the blood perfusion rate in a particular organ is assumed to be undisturbed by the cancerous cells.

Observing the linearity in thermal profile with the variations in tissue metabolism, the superposition theorem is employed to compute the temperature distribution of spherical shaped organ embedding tumour within. Analysis with varying tumour location is performed using the concept of coordinate origin shifting. The temperature reach to the skin boundary bear the signature of availability of tumour in a particular organ of biological body and analyzing and mapping the temperature reveal some idea about the clinical features of tumour. This aspect needs further analysis to pinpoint the correlation among the tumour parameters with temperature at skin surface so that an invasive, non-contact, radiation free diagnostic tool can be invoked employing infrared (IR) thermogram.

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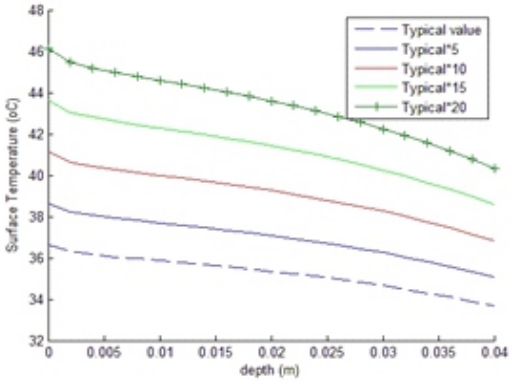


Fig. 1 Temperature Distribution for different metabolic rate

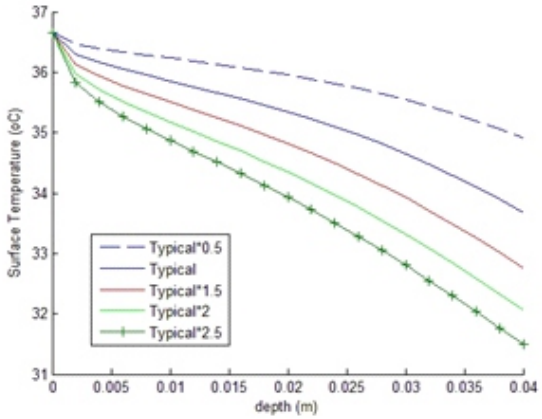


Fig. 2 Temperature Distribution for heat exchange coefficient

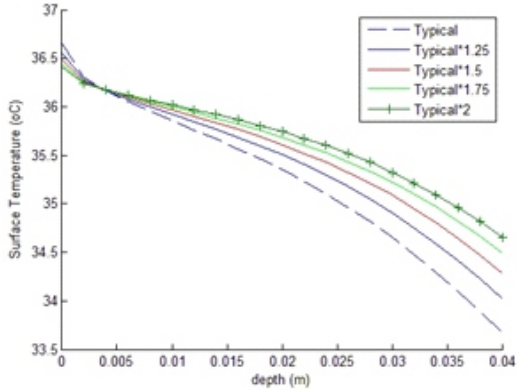


Fig. 3 Temperature Distribution for different perfusion rate

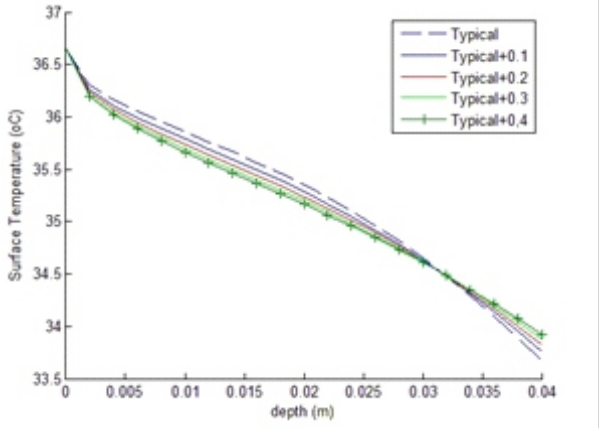


Fig. 4 Temperature Distribution for different tissue thermal conductivities

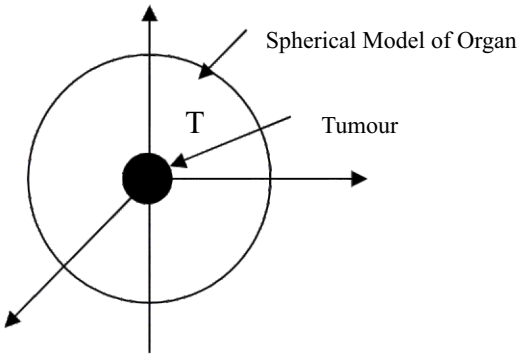


Fig. 5 Tumour at the center of the model

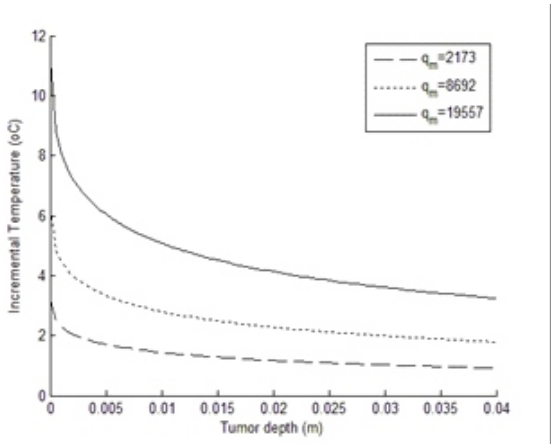


Fig. 6 Temperature Distribution for Tumour

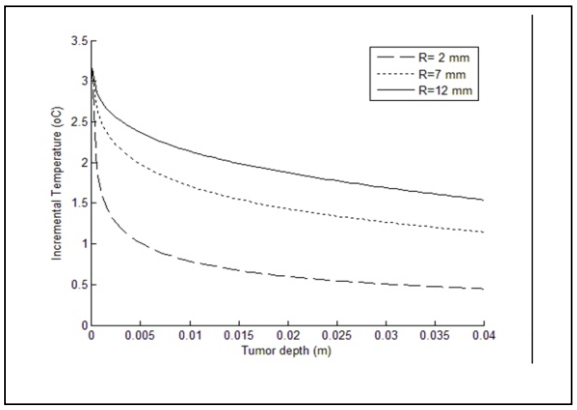


Fig. 7 Temperature Distribution of Tumour

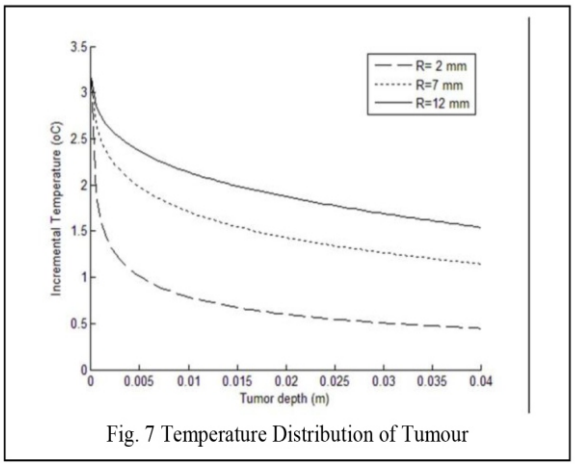


Fig. 7 Temperature Distribution of Tumour

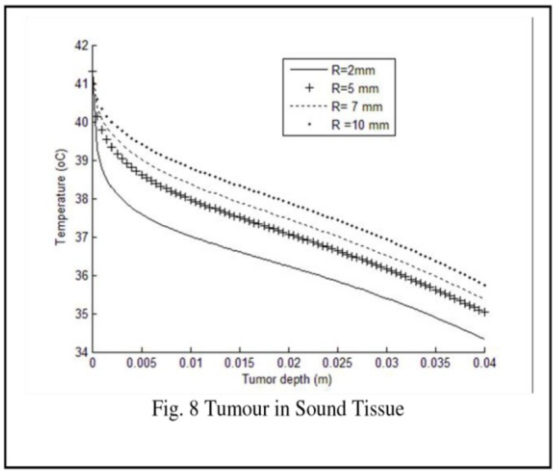


Fig. 8 Tumour in Sound Tissue

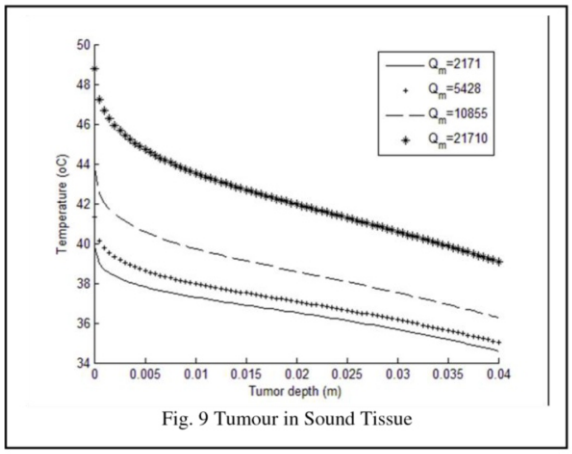


Fig. 9 Tumour in Sound Tissue

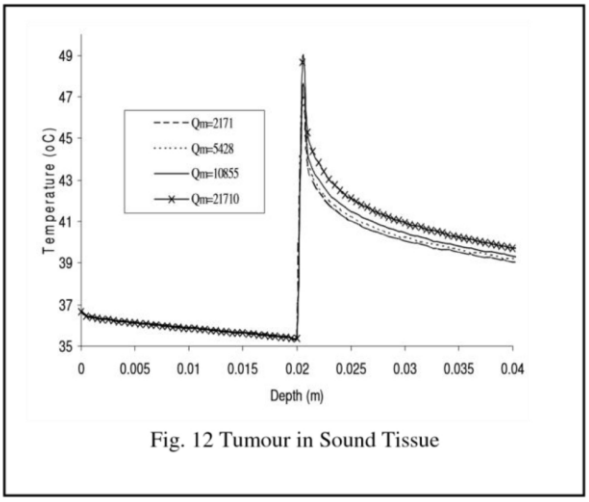
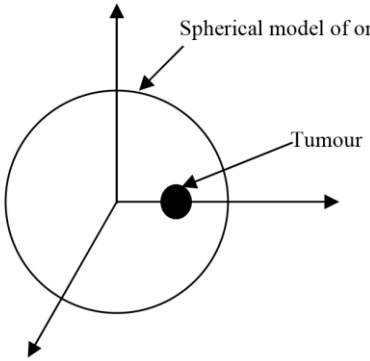


Fig. 12 Tumour in Sound Tissue

Fig. 10



Tumour not at the center of the Model

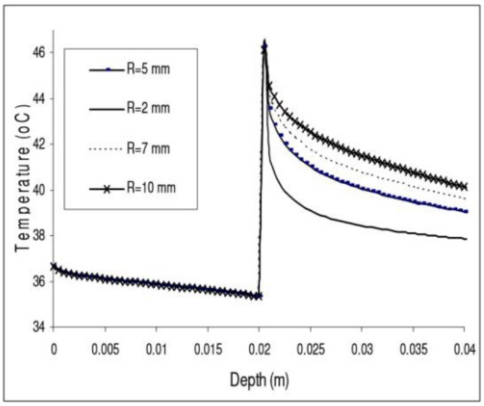


Fig. 11 Tumour in Sound Tissue

New Technique for Automatic Measurement of Welding Seam Geometrical Properties

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ABSTRACT: Welding seam geometrical features are among the measured inputs to an intelligent robotic welding system. For a qualitative welding, accurate measurement of the seam geometrical properties is crucial. Among the many methods of the seam measurement, vision based techniques are the most promising. With vision based, measuring the welding seam geometrical properties involves two steps: (1) image processing of the captured image to extract the seam feature points and (2) conversion of the image points into various measurements of the seam such as width, height and orientation. The image processing step is the most challenging as the image may involve various complex background noises. In this paper, series of image processing steps are performed to make sure the laser profile is accurately extracted and feature points determined. The extracted points were converted to seam geometrical measurements. The computed width result was compared with real width measurements obtained from a test workpiece. Very small measuremen.

1. Introduction

Welding seam measurement is the key component of an intelligent robotic welding system. Various techniques exists for finding and profiling of the welding seam such as Through-arc sensing method [1] and vision based techniques [2]. Vision based methods employ a camera device and an optional light source to measure the seam features. It comprises of two steps: (1) image processing of the captured image from the camera, to extract the seam feature points and (2) conversion of the image points into various measurements of the seam such as width, height and orientation. The image processing step is the most challenging as the image may involve various complex background noises. The image processing can be broken down into two tasks: detecting the laser stripe in the image; and extracting the feature points from the detected laser stripe that identify the seam. For the laser stripe detection, maximum intensity is the most common strategy. Due to the high intensity values (higher brightness) at the region of the laser stripe, many authors explore this characteristic of assuming maximum intensity to be the laser stripe position while segmenting the laser stripe region from an image [3-8]. The idea behind maximum intensity strategy, is to consider every row or column separately as a 1Dimentional signal depending on the orientation of the laser stripe as either horizontal or vertical. For horizontal laser stripe, columns in the image are treated independently. The row position in each column that has the maximum intensity value is selected as a point in the laser stripe. Combining these points from all the columns together makes up the position of the laser stripe profile in the image. Sometimes, instead of taking one point with peak intensity, multiple peaks are chosen to produce a stripe of more than one pixel width and the peaks are subsequently discarded based on specific criteria [3-4, 7].

In [4, 7], the middle pixel among the equal multiple peaks is selected as the laser stripe profile location. In [5], after searching and combining pixels points with maximum intensity, those points caused by false imaging are rejected using temporal and spatial continuity constraints and the profile is obtained using linear interpolation and Gaussian filtering. With the laser stripe segmented, the feature points can be extracted from it. The extracted stripe may experience discontinuities along the lines, and the noise could suppress the corners into higher or lower than their actual number. This makes it more challenging to accurately detect the feature points. The use of split and merge algorithm [6, 9], second central difference (2nd CD) [4, 10], local maxima and minima [5, 8, 11-13], and rule based techniques [14-16] have proven to be effective in extracting the feature points. The extracted points are usually converted into world measurable co-ordinates from which various measurements can be deduced. The measurements computed depends on the type of welding joint preparation used. For butt welding joint, the weld seam width and height are calculated.

In this paper, a new series of image processing steps are proposed to accurately extract the feature points. The steps include color processing, mean and median filtering, line fitting and pixel neibourhood search.

In the next section, the details of the system design and the proposed algorithm will be discussed followed by result and discussions.

2. The Proposed Technique

2.1. The Set up

The proposed system set-up comprises of a 650 nm laser, colored industrial camera and a KUKA KR5 Robot controlled by KUKA CR4 robot controller. The image processing is performed in the computer and the extracted points are sent to the robot via TCP/IP. The points are then converted to geometrical measurements of width and height as shown in Fig. 1. However, in this work, due to the difficulty measuring seam height, only the width is computed.

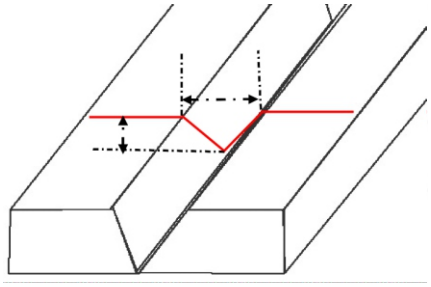


Fig. 1. The seam geometrical measurement from the feature points.

1.1. Image processing

The proposed image processing algorithm is based on the establishment of a reference baseline that represent the vertical part of the laser stripe. Using this line as a guide, the seam feature points can be extracted. Hence, the algorithm comprises of the line determination step and the feature point extraction step. The original image used for demonstration is shown in Fig. 2. The algorithm start with the conversion of the RGB input image into a single channel by color processing to select the red colored pixels as shown in Fig. 3(a). 10 × 10 median filter is then applied to the image to enhance the image. The result is shown in Fig. 3(b). From this image, the laser stripe profile as well as the feature points will be extracted. The extraction involves, selecting the peak points from the image. Before the peak selection, a long vertically oriented median filter is applied to vertically enhance the image, and the intermediary resulting image is shown in Fig. 4(a). The peak corresponds to the maximum intensity pixels in the laser line signal distribution. To extract the peak in each row, the maximum intensity pixel is selected as the position of the laser line in that row. If more than one peak pixel is found in a row, the maximum intensity pixels are arranged into groups separated by 1-pixel. The group with highest number of pixels is selected. The first pixel in the selected group is returned as the position of the laser stripe in that row. The extracted peak line is shown in Fig. 4(b). Finally, the extracted peak profile is fitted to a straight line which represent the baseline as shown in Fig. 4©.

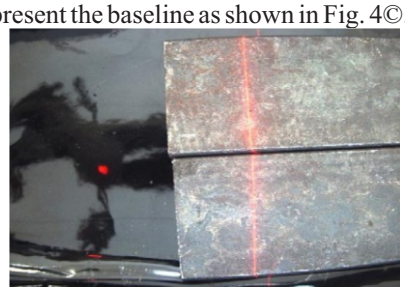


Fig. 2. Original input Image

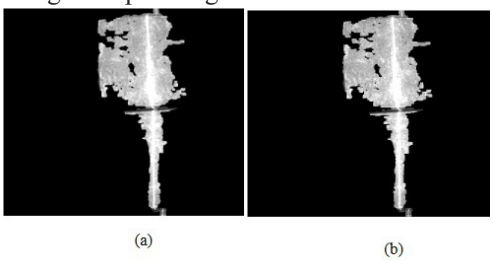


Fig. 3. (a) **selected** red colored pixels of Fig. 2 image; (b) **filtered with** 10x10 **median filter**

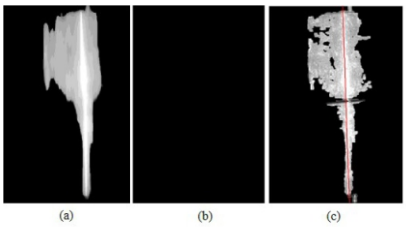
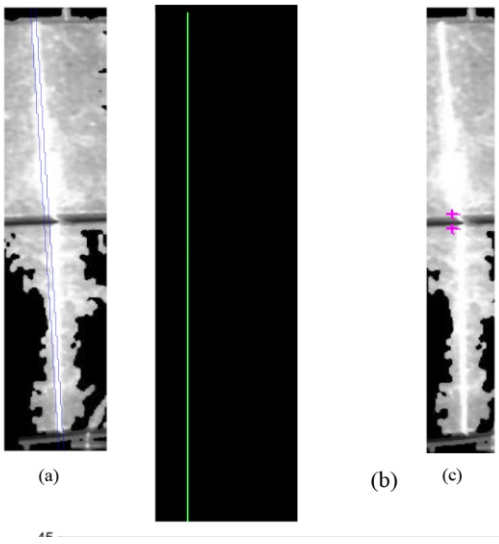


Fig. 4. (a) **vertically oriented median** filter enhanced image; (a) **Peak Line** extracted**;** (e) **Detected Laser line**

The welding seam type used in this work is a butt welding. With this joint, there are three feature points: *Top*; *Bottom*; and *Right* points. To extract the feature point, a vertical Region of Interest (ROI) is first selected from the processed image along the laser detected line as shown in Fig. 5(a). The ROI points are then labelled into groups based on the point's proximity to the fitted straight line as shown in Fig. 5(b). The group with least maximum intensity is selected as the region containing the feature points. From the selected group, the first point in the group is selected as the *Top* feature point and the last point as the *Bottom* feature point. To extract the *Left* feature point, a horizontal ROI is selected from the processed image using the *Top* and *Bottom* points. The peaks in the horizontal ROI are then systematically extracted. The extracted peaks are scanned twice from the top and from the bottom. İn each scan, the points that deviate away from its consecutive neighbour is shifted closer to the neighbour. Two new profiles are generated. The profiles are fitted to a straight line and the intersection point of the two lines is selected as the *Left* feature point. The extracted profile, scanned profile, the corresponding fitted lines, and the detected point are plotted as shown in Fig. 6.



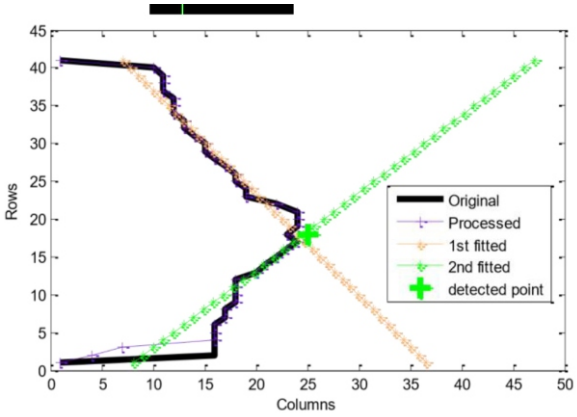


Fig. 5. (a) **vertical ROI** region marked in original image (b)ROI **extracted** and **lebelled** with the value of the group average maximum intensity (c)***Top*** and ***Bottom*** points marked.

Fig. 6. Plot of the scanned profile, the corresponding fitted lines, and the detected point

Finally, the *Top*, *Bottom* and *Right* feature points previously extracted are shown in Fig. 7.

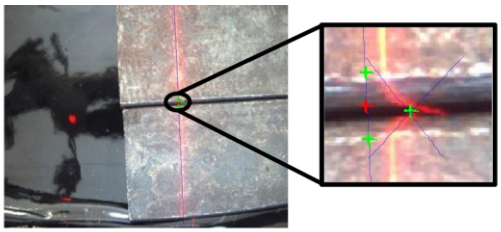
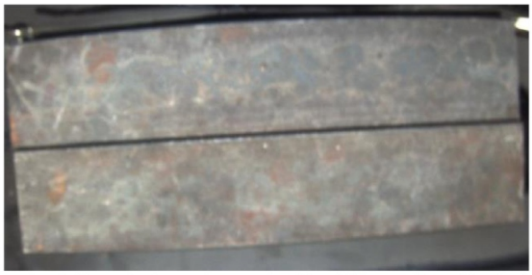


Fig. 7. Final detected points for original image and the points zoomed from original image for clarity of the detected point .

3. Results and Discussion

To evaluate the proposed technique, the algorithm is implemented on a computer with core i7 2.0 GHz processor and 8 GB RAM. The extracted points are converted to robot points and the geometrical measurement are computed. Using these point, the geometrical information can be computed, such as the seam width (difference between y values of *Top* and *Bottom* points), and seam height (difference between x values of *Top* and *Left* points). Tos evaluate the accuracy of the computed algorithm, a straight horizontally measurements is computed to be only 0.2 mm despite the measurement errors. This small error can be accepted in



oriented workpiece shown in Fig 8 is used as the test workpiece. First the robot is thought manually to follow along the seam edges and the difference between the y-values of the seam edges is taken as the measured width. The width is then computed using the proposed technique. The measurements are then compared as shown in Fig. 9. It can be observed that the measured width which is ideally expected to be approximately uniform, itself contain some measurement errors. This is attributed to robot positioning error due to calibration or other robot motion error sources. The difference between the averages of the two the welding environment.

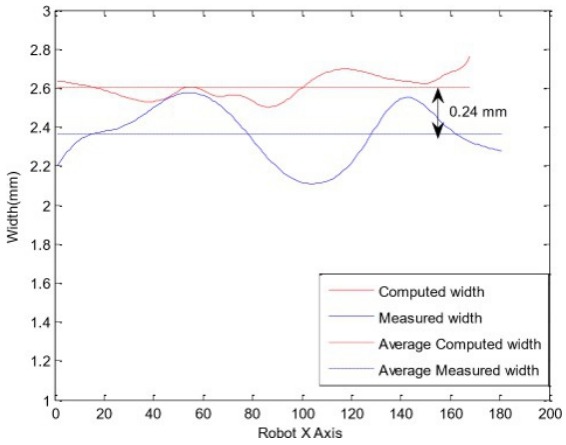


Fig. 9. Plot of the computed width compared with the measured width

4. Acknowledgement

The authors would like to acknowledge the support provided by The Scientific and Technological Research Council of Turkey-TÜBİTAK, (grant no. 114M756) for conducting this research work.

5.Conclusion

In this work, we have presented a new technique that can be used for geometrical measurements of the welding seam. The system accuracy has been evaluated and found to be 0.2mm. However, this can be improved when the error in the measured width is reduced. Another thing is that the test workpiece seam edges used in this work has not been prepared for welding. This may be a probable source of error that can affect the system accuracy. To improve the system, the seam edges of the workpiece need to be prepared for welding.

Future work could be measurement of other geometrical features such as height and orientation.

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Integration of Developed and Asian Developing Stock Markets: Implications for Portfolio Diversification

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ABSTRACT : The study is conducted to investigate the short term as well as long term dynamic interactions between the developed stock markets (i.e. United States, United Kingdom and Japan) and the Asian developing stock markets (i.e. Pakistan, India and Sri Lanka) for the period from January 1998 to December 2012. To accomplish the objective of the study, Johansen & Juselius (1988) cointegration test and Pairwise Granger Causality Test (1969) are used. The result of Johansen & Juselius (1988) cointegration techniques indicated that the only Bombay stock exchange has a long run dynamic interaction with the well-developed stock markets. Moreover, results of Granger Causality test demonstrated that there is a unidirectional casual linkage between Tokyo and Karachi stock exchange. Colombo stock exchange has also unidirectional casual relationship with the New York and London stock exchanges.

Keyword: Integration, Developed Stock markets, Asian Developing Stock markets, Portfolio. JEL Classification: F15, G10, G11, G15.

I. Introduction

Integration of stock markets is significantly increasing since 1980 around the world. Globalization of investment is a key factor that providing opportunity of portfolio diversification for an international investors as well as provide potential for high rate of return. Simultaneously, many of countries are encouraging to capital inflow by taking apart restrictions and deregulating local stock markets (Jain and Bhanumurthy, 2005). The financial specialists and policy makers have great attention about the integration of stock markets. Several reasons of stock markets integration are discussed by different authors. Firstly, integrated stock markets provide risk sharing opportunities for investors. Secondly, integrated stock markets allocate the resources efficiently that may cause a better financial stability. Thirdly, integration of markets is also a channel for international investors to trim down the capital cost (Tai, 2007). Fourthly, it persuades and gives confidence to the investors for the adoption of modern technology and to access the payment system to obtain cost effective intermediation services. The international stock markets integration can support economic growth by encouraging improvement in the domestic markets (Levine, 2001). Integration among stock markets may pose different type of risk such as the Asian financial crisis during late 1990s; the contagion and troubles of financial activities is evidence (Raj and Dhal, 2008). The liberalized and integrated stock exchanges may also put a lot of pressures on the international investors due to unstable political and macroeconomic variables which are usually experienced in Pakistan. For examples, the rapid increase in an inflation rate and changes in political system in Pakistan like after death of Benazir Bhutto 2008, the price of KSE 100 index performance badly experienced (Kanasro et al., 2011).

Stock Markets Integration Based On Asset Pricing Theory

Sharpe (1964) and Lintner (1965) developed the Capital Asset Pricing Model (CAPM) which basically is an extension of Markowitz's (1952) portfolio selection theory that suggest that the investors should make an investment in those markets which are not cointegrated rather than invest all resources in one market. The CAPM concluded that there is a positive and linear association between expected return and systematic risk of a security. Furthermore, CAPM assumed that the capital markets are highly efficient, there are no taxes and restriction on international investment and the transaction cost will be zero. Arbitrage Pricing Theory (APT) developed by Ross (1976), like CAPM, is an equilibrium model which is applied to scrutinize how the stock prices are determined. Competitive financial markets were the based in this theory which ensure the arbitrage those less risky assets give the similar expected return. On the other hand, unlike CAPM that recognize the market portfolio return as the factor; APT model does not particularly recognize these

risk factors in application. These several factors comprise inflation, changes in interest rates, growth in GNP, and major political disturbances.

Co-movement and interdependency is a main dilemma for international investors for the portfolio diversification. According to portfolio theory, if the markets are interacted then there are no benefits of diversification. However, if the developing stock markets of Asia is integrated and depending on developed stock markets then the investors will not encourage themselves to include the Asian developing stock markets in their portfolio diversification. So, the study is conducted to identify whether the Asian developing stock markets are isolated markets or there is any existence of co-movement and interdependency. Moreover, the study is also carried out to investigate the short run as well as long run dynamic interactions between developed and Asian developing stock markets.

II. Literature review

/The asset pricing models is used by (Stehle, 1977) to test the market integration and the domestic and international assets pricing model both were the base of the test. His findings concluded that if the international markets are integrated then the risk should be priced by diversifying through international diversification. (Bekaert, 1995) identified various kind of barriers to investment has a significant relationship with the integrated stock market returns. The unstable macroeconomic variables such as poor credit rating, high rate of inflation, exchange rate etc. are effective hurdles to international capital market integration.(Yang et al., 2003) inspected the short run and long run dynamic linkage among the US, Japanese and ten emerging stock markets of Asia with the special consideration of Asian financial crisis 1997-1998. Their study investigates the effects of financial crisis on stock market integration. The results indicated that these integrated stock markets have a long run and short run linkage during the crisis. Further, they also found that after crisis these markets have more integrated as compared to before the crisis. (Lamba, 2004) find out the short run as well as long run associations between developed and South Asian stock markets. His cointegration test result disclosed that the United States, Japan and United Kingdom stock markets influenced the stock markets of India only while the stock markets of Pakistan and Sri Lanka relatively isolated with the developed markets. (Wong et al., 2004) carried out the study which determined long run relationship among the stock markets of well developed countries and emerging stock markets of Asia. Their studies found that some developed countries' stock markets has a positive relationship with the some Asian developing stock markets, but some of Asian emerging markets are vary from the some stock markets of well developed countries which they make a long run relationship. (Yang et al., 2006) determined the effects of financial crisis on both short and long run relationship among the US and some European stock market. They found that both the short run and long run relationship among the US stock markets and European integrated stock markets were increased significantly after the crisis.

(Raj and Dhal, 2008) discussed the Indian stock market integration with the worldwide and local stock markets and they found a short run as well as long run active interactions between Developed and Bombay stock exchange. The study conducted by (Iqbal et al., 2011) to examine the dynamic relationship between the stock market of US and emerging markets of Pakistan and India for the period 2003 to 2009. The study found that there is no cointegration among the stock markets of US, Pakistan and India. Unidirectional causal relationship has found between New York to Bombay and Karachi Stock exchanges. Moreover, (Mushtaq and Shah, 2011) examined the possible benefits for American investor in south Asian equity markets. They show lower correlation between US and south Asian equity markets. (Kanasro et al., 2011) described that stock markets are providing vary investment opportunities for the local and foreign investors especially in equity investment. According to them the better stock market development has a positive relationship with the economic growth. They also studied that the economic and political instability put lots of pressure on investors to make an investment in the stock markets. (Sriyalatha et al., 2012) find out the Causal linkage and interdependency among the six countries' (US, Japan, UK, Germany, Singapore and Sri Lanka) stock markets for the period pre and post Asian Financial crisis (1990-2010) by using Vector Autoregressive (VAR) and

Vector Error Correction Model (VECM). The results demonstrated that the interdependency among the stock markets are increased after financial crisis particularly the Sri Lankan stock market is affected by all developed markets. (Tahir et al., 2013) investigated to find out the relationship between South Asian markets and well developed stock markets. Their finding indicates that Colombo, Karachi and Dhaka stock exchanges have no interactions with New York, London, Tokyo and Australian Stock exchanges while the Bombay stock exchange has found correlated with only New York Stock exchange. The cointegration results of their study have shown that the developed markets are not integrated with the South Asian stock markets.

III. Data and Econometric Methodology

To accomplish the objective of the study, we took three developed stock markets as independent variable (New York, London and Tokyo Stock Exchange) and three developing stock markets of Asia as dependent variable (Karachi, Colombo and Mumbai Stock Exchange). To represent the equity indices of selected stock markets we have taken S&P 500 index, TOPIX 100 index, FTSE 100 index as independent variables and KSE 100 index, S&P BSE 100 index and ASPI index as dependent variable. The monthly stock prices for the period 1998-2012 from the yahoo finance and the websites of stock markets. All indices are converted into natural logarithms for statistical analysis purpose.

Well Developed Stock Markets

The New York Stock Exchange (NYSE) is the largest stock exchange by market capitalization in the world located in United Stated which was established in 1792. At the end of year December 2012 the total market capitalization of its 1867 listed companies reached US $ 14,085 billion. The S&P 500, or the Standard & Poor's 500, is an American stock market index based on the market capitalizations of 500 large companies having common stock listed on the NYSE or NASDAQ. The oldest stock exchange of the world is London Stock exchange (LSE). The end of year 2012 it market capitalization of listed companies reached US $ 3396 billion. The FTSE 100 consists of the largest 100 qualifying UK companies by full market value. FTSE 100 companies represent about 81% of the entire market capitalization of the London Stock Exchange. The Tokyo Stock Exchange (TSE) was established in 1878 and now it placed as a third largest stock exchange in the world due to high market capitalization. The Total market capitalization of 2,292 listed companies in TSE US$3478 billion in December 2012. Tokyo Stock Price Index, commonly known as TOPIX, along with the Nikkei 225, is an important stock market index for the Tokyo Stock Exchange (TSE) in Japan, tracking all domestic companies of the exchange's First Section.

Developing Stock Markets

The biggest first established stock exchange in Pakistan is the Karachi Stock Exchange (KSE). KSE is now the most modern stock exchange in Pakistan with 600 plus listed companies and its market capitalization are equal to US $ 41.0 billion on May, 2012. KSE is the best performing world stock market in 2002 which was declared by the international Magazine "The Business Week". Karachi Stock Exchange 100 Index (KSE-100 Index) is a stock index acting as a benchmark to compare prices on the Karachi Stock Exchange (KSE) over a period. The selection criteria for stock inclusion in the existing KSE-100 Index is based on three main filters, namely Sector rule, Capitalization rule and Default rule. Bombay Stock Exchange (BSE) is an oldest stock exchange in India which was established in 1875. The world no 1 stock exchange is BSE in terms of listed companies. With an over 5000 listed companies it totals market capitalization US $ 1263 at the end December, 2012. S&P BSE 100 Index is a broad based Index. This Index has 1983-84 as the base year and was launched in 1989. In line with the shift of the S&P BSE Indices to the globally accepted Free-Float methodology, S&P BSE 100 was shifted to Free-Float methodology effective from April 5, 2004. The method of computation of Free-Float index and determination of free-float factors is similar to the methodology for S&P BSE SENSEX. The Biggest Stock exchange in Sari Lanka and most modern stock exchange in South Asia is the Colombo Stock Exchange (CSE) with 287 listed

companies and at the end of December, 2012. It has combined market capitalization US $18.3 billion. The All Share Price Index is one of the principal stock indices of the Colombo Stock Exchange in Sri Lanka ASPI measures the movement of share prices of all listed companies. It is based on market capitalization.

Cointegration Test

A Cointegration test is required a unit root test to confirm that whether the variables are certainly stationary. Therefore, to convert the non-stationary variables into stationary, we used most reliable tests, Augment, Dickey and Fuller (ADF) test (1981) and Phillips and Perron (PP) test (1988). The ADF and PP unit root tests state that if the series data stationary at level then it's designed as I (0). Series which becomes stationary at first difference called I(1).

Johansen and Juselius (1988) Cointegration Test

In order to find out the long run dynamic interaction between the variables, Johansen and Juselius (1988) cointegration test is used. Generally, Johansen cointegration proposed two test statistics through vector auto-regression (VAR); one is trace and other is maximum eigenvalue test. The null hypothesis to be tested for the case of trace test is: there is at most" r "number of co integration vectors while the null hypothesis for the eigenvalue test is there "r" co integrating vectors against the existence of alternative r+1. The null hypothesis of no co-integration against the presence of co-integration is checked by Johansen and Juselius (1988) test. The trace test and eigenvalue can be constructed as:

$$\lambda trace\ (q) = -T \sum_{i=q+1}^{n} \ln(1-\lambda i) \quad (1)$$

$$\lambda max\ (q) = -T \ln(1 - \lambda_{q+1}) \quad (2)$$

ltrace tests the null hypothesis that there are at most r cointegrating vectors against the alternative that $H_1: r = q+1$. The lmax tests the null hypothesis that show the number of cointegrating vectors is r, against the alternative of q+ 1. Critical values for the l*trace* and lmax statistics are provided by MacKinnon, Haug, and Michelis (1999). Before investigating the long run relationship through co-integration, VAC process is required for the selection of lag length. The Johansen cointegration test is based on the following vector auto regression equation:

$$X_t = \mu \sum_{i=1}^{P} \Pi_i X_{t-i} + \varepsilon_i, t = 1,2,3,..,T \quad (3)$$

Where m is a vector of constants and e_t is a normally and independently distributed n-dimensional vector of innovations with zero-mean non-singular covariance matrix W. Moreover, $^{X}_{t}$ is a vector of endogenous variables.

Vector Error Correction Model

In order to correct errors between the integrated variables we apply the Error Correction Mechanism. The residuals (e_t) will be acquired by regressing Y on X that will be stationary, if variables X and Y are cointegrated. e_t I(0)
The relationship between X and Y will be expressed in the form of Error Correction Mechanism as:

$$\Delta Y_t = b_1 + \Delta X_t + \pi e_{t-1} + V_t \quad (4)$$

Whereas, b_1 captures the short run impact of x on y. V_t = is the error term. π is the coefficient term (e_{t-1}).

Pairwise Granger Causality Test

Pairwise Granger Causality test is a technique introduced by Granger (1969); it describes the causal relationship between variables A and B. Granger causality test that a variable A cause variable B if variable B can be better forecast with the historical data of both A and B, then it can be predicted using the history of B only alone. This is indicated that if the anticipation of B specified the history of A is unlike from the unconditional anticipation of B.

$$E(B/BA_{t-k}) \neq E(B/B_{t-k}) \quad (5)$$

IV. Empirical Results and Discussion

Correlation Coefficient

Table 1 shows the result of coefficient of correlation between well developed and Asian developing stock markets. Result indicates that the only LKSE has a

significant and positive relationship with LLSE, only positive relationship with LNYSE and negative relationship with LTSE. The result also shows that LBSE and LCSE have positive relationship with the LNYSE and LLSE While negative linkage was detected with LTSE.

Correlation Matrix of Stock indices Table 1

	LBSE	LCSE	LKSE	LLSE	LNYSE	LTSE
LBSE	1					
LCSE	0.914649	1				
LKSE	0.908575	0.926628	1			
LLSE	0.264485	0.070550	0.027835*	1		
LNYSE	0.33120	0.195030	0.224840	0.88868	1	
LTSE	-0.09814	-0.337681	-0.175501	0.295421	0.135053	1

*Indicates Significance at 5% level

Unit Root Test

Table 2 shows the results of ADF and PP unit root test for index of stock exchanges. Both ADF and PP unit root test results reject the H (0) because monthly indices of stock exchange are not stationary at levels but after first difference they became stationary. The t values of index of all stock exchanges are smaller than the critical values (at 1% significant level) that show the rejection of H (0) of unit root at 1% significant level.

Unit Root Test of Various Stock Exchange Indices Table 2

Variables	Augment Dickey Fuller		Phillips-Perron	
	Level	First Difference	Level	First Difference
LNYSE	-2.085669	-11.77550*	-2.45023	-11.77451*
LLSE	-1.828985	-12.62941*	-2.03847	-12.60425*
LTSE	-1.319208	-11.43177*	-1.31921	-11.37113*
LKSE	-0.507845	-12.72840*	-0.52583	-12.72994*
LBSE	-0.679635	-12.09388*	-0.90588	-12.18805*
LCSE	-0.084599	-11.81040*	-0.25999	-11.91394*

*Indicates Significance at 1% level

Johansen and Juselius (1988) Co-integration Test

We find out the cointegration between the South Asian and well developed stock markets by using Johansen and Juselius cointegration test. According to results of both table 3 (based the Trace test) and table 4 (based on the Maximum Eigen value test) LKSE and LCSE have no integration equation with the well developed markets while the LBSE has found one cointegration equation with the developed markets. The cointegration results of studies (Raj and Dhal, 2008; Tahir et al., 2013 and Ali et al., 2011) justified our results that LKSE and LCSE have not while LBSE has a long run relationship with the developed markets.

Johansen and Juselius cointegration test (Trace Statistics)Table 3

Variables	Hypothesis	Trace Statistic	Critical Value 0.05	Remarks
LBSE	None*	76.86283	63.8761	1 cointegrated
	At most 1	30.7711	42.91525	
	At most 2	16.5402	25.87211	
	At most 3	8.031066	12.51798	
LKSE	None*	36.94462	47.85613	No cointegrated
	At most 1	20.01158	29.79707	
	At most 2	8.822454	15.49471	
	At most 3	1.684029	3.841466	
LCSE	None*	53.92085	63.8761	No cointegrated
	At most 1	30.7742	42.91525	
	At most 2	13.58212	25.87211	
	At most 3	6.034207	12.51798	

* Denotes rejection of the hypothesis at the 0.05 level

Johansen and Juselius cointegration test (Maximum Eigen value) Table 4

Variables	Hypothesis	Trace Statistic	Critical Value 0.05	Remarks
LBSE	None*	46.09173	32.11832	1 cointegrated
	At most 1	14.2309	25.82321	
	At most 2	8.509133	19.38704	
	At most 3	8.031066	12.51798	
LKSE	None*	16.93304	27.58434	No cointegrated
	At most 1	11.18912	21.13162	
	At most 2	7.138425	14.2646	
	At most 3	1.684029	3.841466	
LCSE	None*	23.14665	32.11832	No cointegrated
	At most 1	17.19209	25.82321	
	At most 2	7.547911	19.38704	
	At most 3	6.034207	12.51798	

* Denotes rejection of the hypothesis at the 0.05 level

The finding is providing potential of portfolio diversification in the equity market of Pakistan and Sri Lanka for international investors. Moreover, the Pakistani and Sri Lankan investors can also reduce the risk of international portfolio diversification while investing in the equity markets of USA, UK and Japan. However, Indian equity market is integrated with the equity market of USA, UK and Japan that means the Indian investors cannot minimize the risk while investing in these equity markets.

VectorErrorCorrectionModel

$$LBSE=(LBSE_t-24.4-148.8LNYSE_t+147.4LLSE_t-27.6LTSE_t)_{t-1}$$

(-1.40) (-0.254) (0.499) (-0.036)

The coefficient ECM (-1) explain how much of the short run disequilibrium will be eliminated in the long run. Table 6 shows the result of Vector Error Correction Model. We can conclude that, in case of disequilibrium, LBSE adjustment process quite fast with LTSE (3.6%) and with LNYSE (25%).

VectorErrorCorrectionModel **Table5**

	ΔLBSE	ΔLNYSE	ΔLLSE	ΔLTSE
$(LBSE_t-24.4-148.8LNYSE_t+147.4LLSE_t-27.6LTSE_t)_{t-1}$	-0.001 (-1.40)	0.0010(2.70)	0.0003(0.83)	-0.0003(-0.69)
Intercept	0.004 (0.46)	0.002(0.47)	-7.00(-0.02)	-0.003(-0.57)
$\Delta LBSE_{t-1}$	0.053 (0.66)	0.024(0.74)	-0.007(-0.22)	-0.053(-1.17)
$\Delta LNYSE_{t-1}$	-0.254 (-0.72)	0.042(0.29)	0.24(1.84)	0.115(0.58)
$\Delta LLSE_{t-1}$	0.499 (1.26)	0.067(0.42)	-0.175(-1.19)	0.099(0.45)
$\Delta LTSE_{t-1}$	-0.036(-0.26)	0.052(0.93)	0.062(1.22)	0.140(1.84)
R-squared	0.028	0.060	0.031	0.043
F-statistics	0.99	2.19	1.11	1.55

Granger Causality Test

We used the pairwise Granger Causality Test, after determining the lag length, to ascertain whether the variables are caused or effect to each others. Table 6 showed the result of Granger Causality test of developed stock markets (LNYSE, LLSE and LTSE) and Asian stock markets (LKSE, LBSE and LCSE). The result of Granger Causality test indicates that there is a unidirectional relationship between Tokyo and Karachi stock exchange. This implies that any change in Japan's stock prices effect the stock price of Pakistan in short run. Colombo stock exchange has also unidirectional relationship with the New York and London stock exchanges. This denotes that any change in the stock prices of US and Japan Granger causes the stock price of Sri Lanka. Furthermore, there is no short run relationship of India's stock markets with the stock markets of US, UK and Japan. This implies that any change in the India's stock markets does not change in the stock market US, UK and Japan.

Granger Causality test Table 6

Direction of Causality	Obs.	F-Value	Causality	Prob.	Lags
LLSE Granger Cause LBSE	179	2.30369	No	0.1309	1
LBSE Granger Cause LLSE		0.93112	No	0.3359	1
LNYSE Granger Cause LBSE	179	0.25303	No	0.6156	1
LBSE Granger Cause LNYSE		0.72453	No	0.3958	1
LTSE Granger Cause LBSE	179	1.49873	No	0.2225	1
LBSE Granger Cause LTSE		0.03846	No	0.8447	1
LLSE Granger Cause LKSE	179	2.41004	No	0.1224	1
LKSE Granger Cause LLSE		0.52923	No	0.4679	1
LNYSE Granger Cause LKSE	179	0.60362	No	0.4382	1
LKSE Granger Cause LNYSE		0.38707	No	0.5347	1
LTSE Granger Cause LKSE	179	4.86322	Yes	0.0287*	1
LKSE Granger Cause LTSE		0.0231	No	0.8794	1
LLSE Granger Cause LCSE	179	7.44366	Yes	0.007*	1
LCSE Granger Cause LLSE		1.04903	No	0.3071	1
LNYSE Granger Cause LCSE	179	8.30277	Yes	0.0045*	1
LCSE Granger Cause LNYSE		1.12745	No	0.2898	1
LTSE Granger Cause LCSE	179	0.39614	No	0.5299	1
LCSE Granger Cause LTSE		1.26339	No	0.2625	1

V. Conclusion of the Study

Integration of stock markets play a critical role to providing opportunity for international investors to reduce the portfolio diversification risk. Different Assets Pricing Models such as Markowitz portfolio theory presented by Markowitz's (1952), CAPM presented by Sharpe (1964) and Lintner (1965) and Arbitrage Pricing Theory presented by Ross (1976) for the perspective of portfolio diversification strategies. These theories suggest that if the markets are integrated then the risk should be priced through diversification. This study carried out to examine the dynamic interactions between the well developed stock markets (United States, United Kingdom and Japan) and the Asian developing stock markets (Pakistan, India and Sri Lanka). The correlation results indicate that only Karachi Stock Exchange has significant and positive relationship with the London stock exchange. The Result of Johansen & Juselius cointegration test found that only Bombay stock exchange is integrated and having the dynamic long run interaction with the developed stock markets. On the other hand, Karachi and Colombo stock exchange are not integrated. Hence, there exists no long run relationship. Our findings match with the results of (Raj and Dhal, 2008; Tahir et al., 2013), they also found that the only Bombay Stock exchange has a significant long run relationship with the developed stock markets. The Granger Causality test has found a unidirectional relationship between Tokyo and Karachi stock exchange. Colombo stock exchange has also unidirectional relationship with the New York and London stock

Exchange.

Policy Implication for Portfolio Diversification

It is possible for the investors to avail the international diversification opportunities to reduce the risk, if the stock markets are integrated. Our study proposes some favorable policy implications for both local and international investors regarding portfolio diversification:

First**,** our study results suggest that the international investors significantly condense their portfolio risk by including Karachi and Colombo Stock exchanges in their portfolio because both the KSE and CSE have no long run interaction with the Developed markets.

Second, our local investors can trim down the undiversified local market portfolio risk by including the developed markets in their portfolio. The Pakistani and Sri Lankan investors may invest in all developed stock markets because they are not cointegrated.

Lastly, the evidence of our findings suggest that the international investors should not include the Bombay and developed Stock exchanges jointly in their portfolio and neither Indian investor should purchase both the Bombay and developed markets assets at the same time because Bombay Stock Exchange is integrated with the developed stock markets.

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THE MAIN MACHINE LEARNING ALGORITHMS THAT ARE USED WITH PERSONAL DATA MINING AND THE CHALLENGES OF MINING PERSONAL DATA THAT HAS BEEN OBTAINED FROM SMARTPHONES/WEARABLE DEVICES

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ABSTRACT - The widespread of using information technology and the ease of making them available are leading to inflate amount of data massively, but in random form. Thus, there is a need to develop tools and concepts that have an ability to analysis, and extract knowledge, because conventional ways (statistical approach) do not have ability to deal with that massive amount of data. The machine learning will be focused in this paper in order to understand the main algorithms that are using to mining personal data that are obtained from different sources such as wearable devices and smart phone. In addition, the main challenges that are being faced several of studies through mining personal data.

Keywords - Wearable; Personal Data Mining; Data Mining; Machine Learning Algorithm.

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1. INTRODUCTION One may wonder how the computer carry out tasks, which may seem tough on the machine at first glance, and the others may seem impossible. For example, face recognition; identify speech and calligraphy; the self-driving cars; robots moving and many other applications. Through this paper, we will learn about the concept of machine learning. Machine learning (ML) can be identified as the science that allows machine (e.g. computer, smartphone and wearable device) to act without being preprogrammed to do this act explicitly. In other words, learn how to respond to certain events in the right way autonomously without explicitly learned that before by programmer [1]. It worthily noted that the machine learning is a part of artificial intelligence, as it "set of methods that can automatically detect patterns in data, and then use the uncovered patterns to predict future data" [2, p. 1]. The engineering reasons of why the machine has to learn, which are adaptive purposes, extract important correlation and relationships, which are hidden in a big scale of data (i.e. mining for data in data warehouse), and jobs improvement, highlighted by Nilsson [1]. Furthermore, there are different disciplines that helped the machine learned such as statistics, brain, psychological and evolutionary models, and artificial Intelligence. Obviously, the machine only understand the computational structure. Thus, Nilsson [1] outlined four possible structures, which have to be learned for machine, such as function, finite-state machine, logic programs, and systems of problem solving. In addition, it is worth mentioned that the machine learning are used statistical theory to building mathematical models, in order to reach to certain conclusion (e.g. predict, recognize) from a sample. Thus, in this paper, we will discuss the main algorithms of machine learning, which are used to deal with personal data. As well as, the main challenge in term of data mining which are collected from devices such as wearable computer, and smartphone.

2. BACKGROUND

2.1 Types of learning: At the beginning, as any system (algorithms or program), there are input, and output to reach to machine that is learned. Input: the initial values can obtained by support vector machine, which are called attributes, components, and feature either order or unordered (e.g. {large, medium, small}). As well as, the vector might has the name of attribute and the value at the

same time, for example (Sex: male, age: 19, weight 65 KG) [1] and [3]. Output: there are different forms for output such as real number, which result from function called estimator, categorical value, and Boolean number [1]. Generally, there are different types of learning that are classified according to algorithms' outcome. Precisely, Ayodele [4] classified the learning of machine into four types, while Murphy [2] into two types

a) Supervised learning:

A learning can called a supervised where a function are generated by an algorithm maps inputs in order to achieve desire outputs (i.e. approximate the behavior). The function maps the input's vector into several classes, and a learner (e.g. system) has to learn this function, for example face detection, and identical data. In other words, the classification is a stander formulation of supervised learning [4]. However, regression is another learning approach labelled under the supervised learning. The regression is similar to classification, but it is to predict continuous values rather than discrete categories [1], for example predict tomorrow stock market [5], and predicted temperature inside building [4] and [6].

b) Unsupervised learning:

However to supervised learning, unsupervised learning appeared much harder, because it tries to train machine through the input data without any pre-defined of desire output, and the goal here is to develop and predict new models and hidden relationships between data [4]. However, it is exceedingly applicable and typical more than supervised due to unrequired label data (i.e. unsupervised does not need expert of human to label data which result in large information) [2]. Furthermore, as the supervised learning, the unsupervised has several form of learning such as clustering that sort inputs into unknown groups in advance. An example for clustering is learning Event Patterns for Gesture Detection [7].

c) Semi-supervised learning:

This type of learning is a mix of labelled and unlabeled data (feature or pairs) in order to generate a classifier and appropriate function. Semi-supervised learning tries to reduce human efforts (labelled data problem) and high accuracy achievements (unlabeled data problem). Example of this approach is identify the peptide group in shotgun proteomics datasets [9]. d) Reinforcement learning It is less commonly used. In this type, a police are learned in order to act after an action. In other words, signals are symbolized to reward or punishment based on current behaviour [2]. As well as, it defined by characterizing a learning problem instead of characterizing learning methods. Thus, reinforcement learning provide an interaction learning approach [4], and [10]. Examples of applications that are using the reinforcement learning are' Improving elevator performance using reinforcement learning' by Crites and Barto [11].

It worthily mentioned that there are other machine learning classifications, which are basic and sub, such as Transduction, and Learning to learn. Transduction is almost identical to supervised learning else explicitly construct a function. In other words, it tries to predict new outputs according to training inputs [4].

2.2 Personal data

The widespread use of information technology (smartphone, and wearable) and the ease of making them available are inflated size of the information in a proactive manner, which led to massive data issue. To be precise, Swan [12] stated that the number of devices linked to internet are exceeded the number of the people on the internet, and in 2020 will be about 50 billion users. Data that are obtained from the personal sensing devices (e.g. smartphone, and wearable) called personal data. Furthermore, these technology are gives an opportunity to collect the data about human life (the bodies and daily activity) [13]. However, these vast amounts of data are still unemployed, and there is a need to automated methods such as the machine learning to use that deluge of data [2]. Nevertheless, before that, data mining approach called to explore, analysis, and extract hidden knowledge and essential information. Logically, in this paper we will discuss the main challenge of personal data mining, then algorithms of machine learning, which are use knowledge that mined from personal data.

2.3 Personal data mining

Personal data mining (PerDM) is a new approach, which is depend on the data mining concept, utilized to extract knowledge from personal data of users in order to achieve their needs [14] & [13]. PerDM has two purpose which gained a maximum benefits from personal data, and security and preserving privacy in order to create healthy lifestyles which are well managed. Liew et al. [13] commented that there is a "rapid growth can be observed in

the development of data mining technologies and algorithms", which can evidence by Exploring data by Choe et al. [15]. While, concerns about security and privacy-preservation has raised strongly, due to the widespread of personal data in pervasive and ubiquitous environments [13].

2.3.1 Data source:

Personal Sensing Devices (PSDs) (e.g. smartphone / wearable) gives an opportunity to hand of heterogeneous streams of data from non-sensory and sensory sources. These heterogeneous data (sensing source) include physiological information, sensing contextual, environments, and locations. While the non-sensing and generate streams of multifaceted data stream [13]. In addition, a collector, which is mobile sensor-processing engine (MOSDEN), developed sophisticatedly to sense in Internet-of-Things environments [16]. An advantage of PSDs working as a platform for data processing in order to reduce computational operations by making the initial processing remotely at the user's locality [12] &[13].

2.3.2 Discovery and management of knowledge

Gaber et al. [16] outlined three steps to extract knowledge. Firstly, data pre-processing which carry out several stages such as pipelining strategies and data fusion, anomaly detection, outlier detection, dimensionality reduction, and feature extraction. Secondly, use of the data mining (offline) algorithms or algorithms of data stream mining (online) such as clustering and classification in order to extract hidden patterns (knowledge). It is worthily mentioned that select of the data mining, and stream mining algorithms depends on application whether online or offline analysis [13]. Finally, evaluation of patterns of interesting knowledge, which are discovered, facing against interestingness measures to make a decision either discard or store. In addition, in order to manage data and reach to beneficial datasets aggregation, integration and summarization are carried out.

3. MAIN CHALLENGES OF MINING PERSONAL DATA

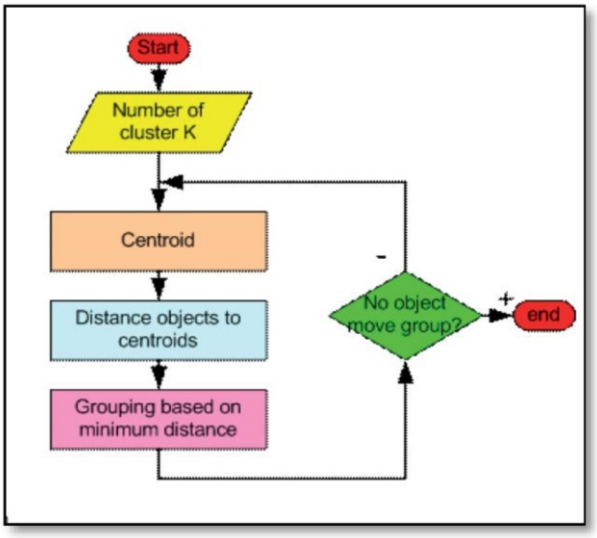
The rapid growth of smartphone and wearable device through last 10 years result in increased attention to personal data mining in the research community, in an attempt to develop algorithms which are scalable and adapt with significantly increasing amounts of data. In order to search for a meaningful cognitive patterns. As well as, entered in various fields of life such as medical, technology and economic [2], [12, [13] and [14]. Thus, in this section, we will examine several challenges raised in term of personal data mining perspective, and point out several studies in this area. At beginning of data mining approach, Jun and Siau [18] claimed that the "data mining continues to attach more and more attention in the business and scientific communities" [p. 1]. As well as, they pointed out several challenges. Firstly, various types of data (e.g. multimedia, hypertext and spatial data) are increasing burdens with handling these types effectively. Thus, data mining approach tend to build a system (algorithm) which able to mining knowledge (interesting, and reliable) in specific type of data. Secondly, these algorithms should be acceptable and predictable as long as increasing of database. Finally, protection and privacy issues, due to different angles of viewed and level of abstraction. Furthermore, dirty data, which is data contents errors result from duplicate record or outdate data, being as a challenging issue in term of mining personal data especially in term of business users. Data minors are trying to provide inputs that are skipped this problem. Visualization and descriptive statistic are used by the data minor in order to understate and identify the problems [27].

Additionally, there are several studies target the mining in personal data especially, healthcare. Sow et al. [19] stated that the major challenge of mining personal data resulted from sensor device are collection data, pre-processing, transformation, and formation and evaluation. These operations are carried out by data mining algorithms, which are classified by [1], [2], [4], and [20]. However, Banaee et al. [21] claimed that the there is a lack in algorithms which are handling special characteristics of personal data from health monitoring system. Therefore, a deeper focus is targeted in order to represents mining task to achieve a deeper knowledge. These tasks tries to predict, detect anomaly, and make a decision. In the same context (health care monitoring),other studies such as Ahmed et al. [22] focused on amount of reliable between user of systems and data which are analysed by the system, in order to rise the trust level of the system. However, trust amount of experts who use the system still insufficiently in term of reactive and proactive decision which are made by system [21]. Furthermore, naturally, security and privacy are the common concerns of the technology. Users of the smartphone and wearable devices are interested where this date will be going and who will have access to this data [13]. However, Fawcett [2], point out that the data, which are collected, store in end-database. As well as, it is obviously mining this data will be in the same platform,

and types of data are collected are not required hide the anonymization. Thus, Fawcett [2] summarized that the discovery of personal knowledge does not need security risks or new privacy. Real-time data is one of the main challenges of the mining personal data. There are several of studies targeted scalability issues of collection of real-time data [25] and [26]. In which, processing data stream (data mining algorithm) in such way congruent with resource of computational, screen real-estate, and considerations of the mobile device (smartphone/wearable) (i.e. energy consumption and heating mission).

4. MACHINE LEARNING ALGORITHMS

Generally, there are many algorithms of machine learning that are in different capabilities in order to deal with various types of problems. As mentioned above in (section 1.2), there are two major type of leaning, and these algorithms are ranged between these type of leaning. In addition, cover all machine-learning algorithms in this paper are difficult. Moreover, in order to reach to the feasibility and faithfulness of discussion and evaluation, we will choose the most important algorithms according to types of learning and type of work (i.e. classification or clustering). Furthermore, at the end of this section we will list several of machine learning algorithms, which have not mentioned through the following section. 4.1 Clustering algorithms: It is a process of clustering whole data into multiple groups with high similarity (i.e. clusters or group of dissimilar data points). These algorithms carry out clustering by divided datasets into several clusters in which similarity between the points within a certain grouping great than the similarity between two points within the different two communities. Precisely, summarizing vast amount of data into groups or categories in order to facilitate process of analysis [13].in addition, clustering algorithms are using different techniques of clustering, which are spectral, hierarchical, subspace, centroid and density [13]. Worthily, clustering algorithms are using unsupervised learning numerously [28]. However, Liew et al. [13] stated, "limitation of insufficient resources is a bottleneck that hampers the maximization of these algorithms" [p. 18]. K-means is one type of clustering algorithms: 4.1.1 K-means algorithm This algorithm are being used to cluster data into several categories depending on their characteristics to K clusters. Clustering process tries to reduce the distance between the data and centroid cluster [13]. Ayodele [4] demonstrate the k-means algorithms into three steps, which are determination a center coordinate, determination a distance between each objects and center, and cluster the object according to minimum distance. To be precise, k



centroids are defined, which are one for each cluster, and put these cannily due to different location mean different results. Thus, these centroids have to be placed far away from each other in order to clear results. Then, try to associate each point (within a data set) with nearest centroid until there is no pending point. The figure 1 below demonstrate the k-mean algorithm procedure [4].

Figure 1. K-means algorithm.

In addition, Marsland [29] started that the k-means algorithm has ability to deal with noisy of readings data. However, this feature are depends choosing of clusters correctly (i.e. replacing the each noise by cluster centre). Furthermore, Xu & Wunsch [28] described that the time complexity of k-means algorithm is near to linear (O (N)), and it is work effectively with large scale of datasets than the hierarchical clustering (quadratic computational complexities). In the contrary, it is sensitive to initial value (i.e. select different initial value produce different results) [28] & [13].

4.2 Support Vector Machine algorithms (classification and regression):

One of the most distinct and powerful algorithm that are using supervised learning approach is a support vector machine (SVM). SVM are being used in term of

classification, and regression sets of variables based upon Statistical Learning Theory [29], [34] & [30]. An n-dimensional hyper-plan are constructed in order to carry out a classification that are separate the dataset into two group optimally (separated by margin), and these two layer are a perception neural network. Furthermore, SVMs are gaining character of multi-layer perceptron classifiers, alternative training method for polynomial, and radial basis function by using the function of kernel. In other word, by solving a problem of quadratic programming (with liner constraint) gives ability to find networks' weights [4] & [30]. It is worthily mentioned that the extraction of features are carried out by transformation the attributes to produce vectors, and the vectors that are near to the hyper plane known as support vector [3] and [4]. Furthermore, SVMs have a flexibility to select a form of the threshold between the two groups (e.g. linear or non-linear but non-parametric) and not the same for all data. In addition, Murphy [2] claimed that the SVMs are 'very unnatural' in term of probabilistic because SVMs encode sparsity and kernel by using algorithm trick, and outputs not resulted probabilistically which are lead to difficulties particularly in multi classification form. Moreover, Auria & Moro [31] showed that the SVM algorithm produce results effectively in high dimension space. However, large datasets might increase the time performance due to higher training time (i.e. time complexity of training time = O (n2)) [32]. In the contrariety of k-means, Natarajan et al. [33] claimed that SVM does not perform well with noise due to classes overlapping [33].

4.3 Decision tree (DT) algorithms:

A DT is a natural and classic model of learning that is related to the essential notion of computers science 'divide and conquer' [37]. DT is one of the most popular and powerful algorithms to classify and predict patterns from available data in machine learning approach [13], [37] and [38]. It can be seen DTs successfully in several area such as signal classification [35], and remote sensing [36]. DT is an exploratory form appears in the form of a tree, and each branch represent a question taxonomically, while leaves refer to patterns, which are built from datasets. The basic rule in building a decision tree is to find a better question in each branch of the tree. Consequently, the question divides data into two parts. First part answers the question while the second does not. Therefore, the decision tree will be built through sequence of questions [37] and [39] (see figure 2). To be precise, Safavian & Landgrebe [37] summarized the decision tree procedure into three steps, which are splits selection; determine terminal node (answers); and training the terminal nodes (i.e. labelling class). Furthermore, Rokach & Maimon [39] outlined several decision tree algorithms such are ID3, C4.5, CART, CHAID. In the following two sections, ID3 and C4.5 will be discussed.

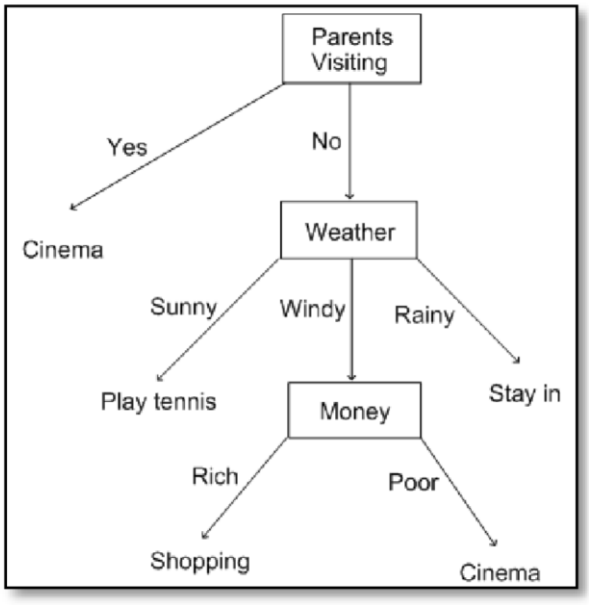


Figure 2. Example of a decision tree.

4.3.1 ID3 algorithm:

ID3 is a simple form of decision tree and widely use in term of classification [29] & [39]. Information gain are used in this algorithm as splitting criteria of features to produce a classifier (a decision tree) recursively from high level to low level. The recursion procedure cease when either no feature left or remain only one class in the data [29] & [41]. In addition, Suh [29] demonstrated the resulted decision tree as "leaves represent the classes and the internal nodes represent the attribute –base tests which are connected with the branches that represent the outcome of each test" [p. 100]. It is worthily mentioned that the handling noisy data is powerful feature for ID3, due to high level (certain degree) of heterogeneous. However, Rokach & Maimon [39] outlined several backword such as The difficulty of determining the depth of the tree over-classified (over-fitted) due to testing small

sample, limitation test (i.e. testing one sample at a time to predict decision), and deal with continuous data is computationally expensive [29] & [41].

4.3.2 C4.5 algorithm (Associations):

C4.5 is one of decision tree algorithms that are updated of ID3 algorithm to deal with ID3 weaknesses. However to ID3, C4.5 tries to generate decision trees with known depth; deal with continuous data (e.g. temperature degree); process date that are content missing value, and improved the computational performance of previous algorithm [39] & [41]. In addition, C3.5 are using a concept that are called gain ratio by applying an entropy concept. Gain ratio is an extra feature to the criteria of attribute selection (i.e. splitting criteria). This algorithm carry out calculation of entropy for a class S that might contain a separating node, which are a node are separating a collection of data T to several subsets (t1, t2 .. tk) in order to calculate the gain ration. Then, gain ration will be calculated. This operation are iterated for each class until find the class with high gain ratio. Therefore, initial tree are generated through training tests [41]. At present, Liew et al. [13] claimed that the c4.5 are a significant algorithm to deal with noisy and complex data such as medical domain due to making a right decision [43].

4.4 Artificial Neural Network algorithms (ANN): ANN is a one of the methods that are used to mining data through simulating the human neural network. ANN are processing data in distribute and parallel manner massively in which store knowledge of practical experiential and experimental information in order to make an effective decision. The basic idea of ANN is to acquisition knowledge by number of training process and store this knowledge by using lattice of weights. In term of architecture, numerous of processing unit called neurons structured the ANN. In addition, as any system, the ANN has input units, processing unit (store and recognize), to generate outputs (prediction) [41], [43] and [45]. Suh [41] describes the structure of ANN that are consist of three different layers (i.e. set of node for each layer). To be precise, input layer (set of nodes accept patterns of input), hidden layer (nodes receive inputs' layer result to carry out extra computation), and output layer (set of nodes carry out operations in order to give output to user). Furthermore, these layer use three data of datasets, which are training set, validation set, and test set. Generally, ANN gives a lower amount of error of classification, and high level of robustness comparison with decision tree algorithms. However, time of creation is longer than decision tree algorithms [41]. Furthermore, ANN are being used in different area such are pattern recognition [46], clustering [47] and prediction such as prediction of stock market returns [48], and weather forecasting [49] by using different model (algorithms). Suh [41] outlined several algorithms ranged between supervised and unsupervised learning. Therefore, the following section will explain two major algorithms of ANN.

4.4.1 Perceptron algorithm:

One of the supervised learning algorithm is a perceptron. It is a first algorithm that are simulate the neural network. Perceptron is a simple form of Feed-Forward Neural Network (i.e. each neuron are feeding itself or others). Architecturally, it has two types, which are single layer, and multi-layer perceptron [45].

a) Single layer perception

It is called linear classifier. In the other meaning, this algorithm tries to solve problems that could be separated lineally, and it has input layer with only one neuron. Each neuron carry out a classification of input vector in two categories. Thus, the output will be either 1 or 0 [50].

b) Multi-layer perceptron

This type has multiple neurons, and each neurons has one decision boundary. However to single layer type, this type can classify the input into numerous categories, and different output vector represent each categories [50].

Furthermore, perceptron algorithm tries to train elements by training set once element at a time (online algorithm). As well as, it use thresholds and weights(either positive or negative) in order to reduce the error of predication in which actual outputs are compared with desired outputs a function which are called error function. It is worthily notice that perceptron algorithm are being used by several studies such as Le & Van Nguyen [52], and Batten [53]. Eventually, Watts [51], who is expert in Computational Intelligence, claimed that perceptron are efficient algorithm, and address linearly separable. However, it does not deal with non-linearly separable.

4.4.2 Back-propagation algorithm (BP)

BP is a one of the major algorithms that use ANN approach and it an iterative gradient algorithm. BP has been designed in order to reduce the 'mean square error'

between the desired output and actual output. As well as, it carry out a classification process through vector of training data [1], [41] & [54]. One advantage of BP algorithm, which was claimed by Suh [41], are 'deal with incremental training'. In other meaning, the algorithm are updating the weights after processing of each case. However, these weights are not assemble in fixed point in the function of error. Thus, the rate of learning process has to be slower in order to successful convergence. Furthermore, Cilimkovic [54] analysis the algorithm in four steps which are feed-forward computation; back propagation to the output layer; back propagation to the hidden layer; and Weight updates. Worthily, when the error function value has become adequately small, the algorithm is cease. Therefore, BP algorithm is flexible and process in parallel. Consequently, lead to reduce time of computational [41]. However to above, local minima occurs during the processing due to changing the weights, and adjusting large values of weights during the training might result in network paralysis [55]. Recently, this algorithm are being use in several studies such as Manalo et al. [56], and Thanammal & Sudha [57].

	Algorithm	Type of learning	Reference
1	Linear Regression	Supervised learning	[58]
2	K-nearest Neighbors	Supervised learning	[1]&[59]
3	Naive Bayes	Supervised learning	[59]
4	Apriori	Unsupervised learning	[60]
5	Fuzzy Clustering	Unsupervised learning	[61]
6	Q-learning	Reinforcement learning	[62]

4.5 Other algorithms

In addition to section 4, there are others algorithms, which are being used in machine learning field, that were not mentioned. Therefore, following table refers to several of those:

5. CONCLUSION AND RECOMMENDATIONS

Ultimately, this paper has introduced an overview of main concept of machine learning approach by outlined the major types of learning that are classified according to type of desired outcome. These are supervised, unsupervised, semi-supervised, and reinforcement and other (section 2.1). As well as, the widespread use of information technology (smartphone, and wearable) and the ease of making them available are inflated size of the information in a proactive manner, which led to massive data issue. Thus, machine-learning algorithm are being focused significantly by large number of studies in order to propose algorithms that are mining vast amount of data perfectly to achieve knowledge. As well as, this mining in personal data are faced several of challenges ranged between many issues such as efficiently, privacy and accuracy. Therefore, planning data mining operation lead to accuracy results. In other words, determine the problem and desire outputs; build datasets; and select a suitable algorithm that is success the goals. Algorithms of machine learning are numerous and differ in duty and approach. Precisely, classification, clustering and association are the major approaches of machine learning algorithm. As well as, they represent the data in various form such as vectors (see section 4.1 and 4.2), decision trees (section 4.3) and neural network (section 4.4). To sum up, the machine learning considered emerging science strongly, and it is expected to play a critical role in many of the smart applications in the future in addition to his current role in influencing numerous areas in our lives without even know. As well as, Internet of Thing (IoT), which is "The general idea of things, especially everyday objects that are readable, recognizable, locatable, addressable, and controllable via the Internet" [cited in 14, p. 218], increases a burden of machine learning algorithms to deal with that features. Thus, there is a need and more focus of using machine-learning algorithms in order to add smart features devices that are under the IoT term.

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Human Resource Management (HRM) Practices and Organizational Performance: An empirical investigation of some selected Polytechnic institution in Nigeria

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ABSTRACT Tertiary institutional management, albeit the Polytechnic sector in Nigeria and indeed globally, has remained a domain for exhibiting high potentials to catalyze industrial development and economic growth. Lack of, or inadequate Human Resource Management (HRM) practices perhaps, have undermined the need to identify, examine and investigate the extent and impact of HRM practices in Nigerian Polytechnics. Using some selected Polytechnic institutions as case study, the paper seeks to investigate the relationship between HRM practices and organisational performance in the case study Polytechnics. The primary data of this paper is based on questionnaire administered to one hundred and ten (110) respondents randomly drawn from the staff of the case study Polytechnics. Isolated areas of HRM practices for the study, with strikingly exciting and interesting research findings are training and development, communication and communication style of management, and the participation in strategic decision-making operations of the Polytechnics. Highlights of findings include inadequate training and development programmes to bring about maximization of employee potentials; a robust feedback mechanism that is anchored on defective style of communication; and participation in decision-making in the realm of strategic operations that is highly exclusive to management staff and the Governing Council without due recourse to other staff of the Polytechnic

Keywords: Tertiary Institutions, HRM Practices, Organizational Performance

Focus On Form In Task Based Language Teaching: Pre-Task Or Post-Task

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ABSTRACT : This qualitative study investigated the perception of MA TEFL Students related to two different ways of providing form-focus instruction in Task Based Language Teaching (TBLT), pre-task and post-task. From semi-structured interviews conducted to four participants, it has identified that MA TEFL students think that providing the focus on form in the pre-task stage gives all students an equal chance to practice the language form when working on the task, improves awareness of the language form target, supports students while working on the task, and motivates unconfident students. However, it is possible that this approach also makes students hesitant to speak. On the other hand, providing the focus on form post task is believed to improve students' understanding and retention of the language form and stimulate them to learn the meaning of vocabulary based on its context. However, it is regarded as being beneficial mostly only for higher-level learners.

Behavioral intention on tourism destination of wellness tourists

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ABSTRACT : Development and expansion of wellness tourism have enabled many countries to design their own wellness tourism using the existing infrastructures and resources (Voigt, Brown, & Howat, 011). In this regard, the aim of this study is to analyze empirically the effect of benefit sought (Haley, 1968; Pierskalla et al., 2004) and brand equity (Aaker, 1996; Yoo & Dondhu, 2002) on behavioral intention (Schiffman & Kanuk, 1987) of destination on wellness tourism. Using the proposed model and its hypotheses, this research verifies the model and show each factor's relationships. Finally, the findings of this study assist in understanding of wellness tourists' behavior and provide implications. Also, according to the analysis results of these hypotheses, appropriate policies that develop the wellness tourism industry are expected to be induced. This study utilizes the PLS-SEM (Partial Least Square - Structural Equation Modelling) method in order to measure the overall model fitness level and statistical significance of all paths in proposed research model. Specifically, PLS-SEM that is insensitive to sample size (Ringle et al., 2012). As a result of the analysis, benefit sought factor has a significant effect on brand equity and also, indirectly on visit intention via brand equity. The results of this study are expected to provide both theoretical and practical implications. Theoretically, the current study tests the appropriateness of relationships among three variables: benefit sought, brand equity, and behavioural intention explaining wellness tourists. Practically, according to the analysis results of these hypotheses, appropriate policies that develop the wellness tourism industry is expected to be induced. However, the activities on wellness tourism in this study is needed to search according to the characteristics of a particular destination.

Keywords: Behavioral intention, benefit sought, brand equity, wellness tourism, PLS-SEM

Developing a Multiple-Criteria Decision Methodology for the Make-or-Buy Problem

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ABSTRACT: Engineering design is the process of developing a system, component, or process to satisfy desired requirements. It is a decision making process, in which the basic mathematics, and engineering disciplines are utilized to convert resources optimally to achieve a predetermined objective. It also includes a variety of realistic constraints such as reliability, safety, economic factors, ethical and social impact.

This work proposes a methodology and procedure for make-or-buy problem. Companies following this methodology are guided through a structured sequence comprising identification of factors for the make-or-buy decision, and the comparison of internal sourcing and external sourcing factors against each other. Multi-attribute decision-making is utilized to present an overall make-or-buy decision recommendation.

This study includes two stages. The first stage builds the conceptual model for the make-or-buy decision problem. It develops the framework of the problem with a suggested procedure that is composed of three phases. The second stage contains a case of a company having a make-or-buy problem. The solution includes quantitative and qualitative components. Analytic Hierarchy Process (AHP) is used to find the importance of each criterion. Sensitivity analysis and simulation tools are used, such as: SensIt, RiskSim and Excel spreadsheet. One advantage of the suggested methodology is that a spreadsheet based optimizer is utilized to implement it. That it is one that provides optimal solutions and at the same time utilizes a broadly used environment for implementation. So the suggested methodology should be a practical tool for decision making. The final decision for this case is found and recommendations are provided.

Keywords: Analytic Hierarchy Process (AHP), make-or-buy, multi-attribute decision-making.

Literature analysis of the effect of transformational leadership on the work outcomes: an update of relationships and mediation processes

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ABSTRACT: The objective of this semi-systematic review is to revisit the relationship between transformational leadership (TFL) and work outcomes in order to assess the relationships and mediation processes. Since the appearance of the TFL theory more than three decades ago, a number of factors have been claimed to mediate the relationship between TFL and work outcomes, which manly considered as positive relationships. However, there have not been many efforts to bring these factors under one unified research, at least in regular basis. This project, therefore, aims to examine the recent literature and tries to spot the recent trend related to how TFL affects work outcomes. In addition, this project purposes to ascertain the factors that mediate the relationship between TFL and work outcomes.

Combined approach of traditional review and some systematic review procedures has been applied to review the literature in order to evaluate the relationship between TFL and work attitudes. Therefore, the literature was reviewed to develop a critical investigation and an understanding of the research questions: *Is TFL an influential leadership style? Does TFL affect work outcomes? What factors mediate the relationship between TFL and work outcomes?* Enormous number of articles were skimmed and scanned, with attention to the abstracts, until only 22 articles were selected from nine high ranked journal in the related field.

Analysis has shown that TFL and work outcomes are associated either directly or indirectly (via mediators). There are positive, direct, and mediated relationships between TFL and work outcomes including satisfaction, effectiveness, trust, relatedness, organisation climate, efficacy, empowerment, identification, engagement, and commitment. However, researches advised to pay attention to some factors when evaluating the mediation process between TFL and work outcomes such as mediation stage, overlap between concepts, and the subjective evaluative nature of the assessment tools that would result into indistinct constructs.

Polytechnics as learning organisations: Any vista for Nigerian Polytechnics?

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ABSTRACT : Although the concept of learning/ learning organisation has become familiar in many organisations, it has been observed that Polytechnics in Nigeria have not applied these important concepts to their organisational functioning owing to a number of challenges. In order to explore if there exist opportunities for Nigerian Polytechnics to become learning organisations, the research work posed the following questions: as Higher Education Institutions, do they apply new knowledge to improve their performance; do they change to new ways of operating? Do they adapt to new circumstances and pressures in the environment in which they function? Using semi- structured interviews administered to academic staff and top-management staff of two case study Polytechnic institutions, findings indicate that Nigerian Polytechnics are presently some distance away from being learning organisations.

Title: Rainfall forecasting using support vector regression analysis coupled with genetic algorithms

Setu Hitesh Dave, Rahul Bakrania, Mallika Taneja

ABSTRACT : The present paper attempts to forecast rainfall in India using support vector machine or support vector regression(SVR) method. The study proposes an approach at searching optimal parameters for support vector regression and then creating SVR model employing real value genetic algorithms. Support vector regression model has been proved useful in forecasting in complex scenarios like stock market, tourism patterns etc. Rainfall in India is very unreliable and the aim of this study is to forecast rainfall and find out the accuracy of the method in comparison to true values.

The Role of Pleasure in Man's Happiness according to Aristotle and Mullah Sadra

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ABSRACT : Pleasure is the main motivation for man's actions, and happiness is the ultimate end of ethics. The role of "pleasure in happiness" is a fundamental topic in the philosophy of ethics. The present study deals with the viewpoints of Aristotle and Mullah Sadra, two thinkers who represent the Western perspective and the Islamic school of thought, respectively. Aristotle believes in the corporal and the intellectual pleasure. In the Nicomachean ethics, Book VII, he deals with three theories on pleasure, and he originally accepts the goodness of pleasure. In Book X, however, he regards pleasure as a kind of action which can be the complement, and a function of actions, contrary to what is said in Book VII in which he says that pleasure is the end in itself. Therefore, pleasure is a function of actions in terms of goodness or badness. The good pleasure, according to Aristotle, contributes to happiness. An example of good pleasure is the pleasure resulting from contemplation. According to Mullah Sadra, man's true happiness will be realized when he achieves his ultimate goal, that is, the proximity to God. Mullah Sadra believes that man has a soul and a body, and that the soul can have its own pleasures, and that man can enjoy the highest level of pleasure in the light of proximity to God since true pleasure comes only from man's proximity to God.

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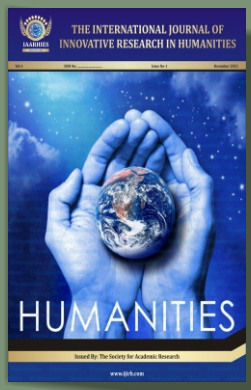

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