

PhD Projects at Northumbria University

Title: Intelligent Pathological Testing for Diagnosis using Smart Phone (NU_PHD1)

Contact Person: Prof. Alamgir Hossain

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The increasing popularity of smart phones with sensing capability is giving researchers the opportunity to design and develop mobile applications. Particularly, mobile technologies are creating new value in healthcare domain. Handheld devices and mobiles have been regarded as promising platforms to provide affordable solutions, scalable approaches to widespread care, and ultimately better patient health outcomes due to mobility. This research will investigate into an innovative development of a low cost smartphone based intelligent system integrated with microscopic lens that allows pathological testing in remote areas, poor and developing countries for regular diagnosis. Hybrid AI (artificial intelligence) algorithm will be used for pathological diagnosis with a particular focus to blood testing to identify the diseases for diagnosis.

Title: Intelligent Mobile based Decision Support System for Automatic Drug Identification (NU_PHD2)

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The increasing popularity of smart phones with sensing capability is giving researchers the opportunity to design and develop mobile applications. Handheld devices and mobiles have been regarded as promising platforms to provide affordable solutions and scalable approaches due to their availability and accessibility. This research will investigate into an innovative development of a low cost smartphone based intelligent system integrated with microscopic lens that allows drug testing in remote areas and at any time. Hybrid AI (artificial intelligence) algorithm with crystal pattern recognition technique will be used to identify the type of the drug.

Title: An Intelligent Decision Support System to Improve the Treatment for very Low Birth Weight Premature Babies (NU_PHD3)

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In preterm infants, policy and practice affects exposure to breast milk, antibiotics and probiotics which in turn are likely to have significant effects on gut microbial communities colonisation and dynamics. Clinical collaborators have recently

commenced a large scale clinical trial to study whether supplementing infant feed with bovine lactoferrin has a significant impact in reducing necrotising enterocolitis (NEC) in premature very low birth weight babies, as has been previously claimed in the literature. In this study the aims are to identify the impact of these exposures on the development of the gut microbial community and subsequent prevalence of NEC and sepsis. This research will investigate into the modelling for therapeutic intervention, typically with a combination of antibiotics affects the development and dynamics of the gut community and subsequent clinical outcomes for the infants. Combining clinical, demographic and microbial data will provide a framework for developing a decision based tool to improve the treatment and outcomes for very low birth weight premature babies. To achieve this aim, a data warehouse for the patient's history and a knowledge based decision support scheme using artificial intelligence will be developed.

Title: Intelligent Rapport Agents with Autonomy and Adaptability in Educational Games(NU_PHD4)

Contact Person: Dr. Li Zhang

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This PhD project aims to develop an intelligent system with advanced functionalities in natural human-robot/agent interaction and robot-robot/agent cooperation to benefit users. It will employ intelligent agents embodied either in a humanoid robot or handheld devices. The intelligent agents will be capable of performing affect sensing from multimodal interactions and will also be equipped to express empathy in their dialogue, tone of voice and body language. Advanced machine learning algorithms will be explored for the above developments. The PhD candidate is required to hold a good master degree from Computer Science or Engineering with excellent C++/Java/Python programming and English communication skills.

Title: Wireless Sensor Networks for Healthcare (NU_PHD5)

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Applications are invited from those interested in pursuing a PhD in Wireless Sensor Networks at Northumbria University, UK. The selected candidate will pursue research in health care application of WSNs focusing on security, and quality of service aspects of sensed medical data. The research will be aimed at developing intelligent algorithms and protocols (based on artificial intelligence, adaptive learning, optimization etc.) to optimize end-to-end QoS. The research will also include development of novel analytical formulations to investigate QoS aware scheduling and routing strategies for large-scale WSN deployments in healthcare.

Title: User Experience of Enterprise for the Improvement of Employee Productivity (NU_PHD6)

Contact Person: Dr. Honglei Li

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The PhD applicant would be expected to have experience in ERP systems and have skills in business process management. The industry experience with ERP system, especially with SAP ERP systems are most appreciated. The research area would focus on business process management, specifically, user experience of enterprise systems, process innovation, business process for SMEs, and ERP systems for SMEs are preferred.

Title: Visible light Communications (NU_PHD7)

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In recent years there are increasing interests in visible light communications (VLC) for indoor wireless communications. It is envisaged that VLC will be widely adopted for various communication applications in home and office environment. In this work we would like to investigate the mobility model of VLC system and also integrate VLC features to existing handheld appliances/devices or Smartphone. Theoretical work and practical demonstration are required for evaluation. The person is expected to have knowledge in telecommunications and optical communications. It is desirable if the candidate has practical experience and good programming skills.

Title: Musculoskeletal Analysis and Simulation of Human Motion (NU_PHD8)

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Since human movements are driven by muscles and the underlying bone structure, a deflected movement usually indicates problems in the musculoskeletal system. As motion capture devices have become more popular, experts from the medical sections have shown increasing interests to analyze captured motion from patients suffering from injury or movement-related sickness. In this research, an algorithm will be designed to analyze captured motion and identify possible muscle weakness or damage. Simulation will be conducted to predict the possible results after the improvement of muscle condition during training or treatment. With the detailed analysis, it is expected that the effectiveness of physical rehabilitation and sport training can be improved.



ULL PhD Subject Proposal

Erasmus Mundus Sustainable cLink Project

Sept. 2012 - Sep. 2016 (24 months)

Country: France

University: University Lumiere Lyon 2 (ULL-PHD1)

Laboratory/Department: DISP –Lyon 2 Laboratory

Domain (Computer Science, Management, Economics...): Computer Science

Doctorate Title: Computer Science

Abstract (*context of research, objectives, methodology... - 1 page min, 2 pages max*):

A Collaborative Decision Support System for Disaster Management in Humanitarian Supply Chains: A Multi-Agent Approach.

Every year, disasters are impacting more than 210 million people. Year after year, their frequency increases. So is the number of Non-Governmental Organizations (NGOs) created to help those in need before or after a disaster. Despite many efforts to improve the coordination capabilities of humanitarian organizations, humanitarian actors in the field usually have a really limited knowledge of what others are doing. Yet, "in a world of scarce resources, although humanitarian action has no price, it obviously has a cost, and an improved management of this cost has an influence on the ability to send relief to a varying number of operation sites. Among possible savings, the best logistical coordination plays a significant part, for example in trying to avoid useless equipment or food redundancies in one place when a few miles further, both are sorely lacking."^[1]

Many barriers hinder coordination in the humanitarian sector. The 2005 humanitarian reform and its cluster approach imposed "a myriad of guidelines and task forces at the global level and numerous meetings at the field level. This system makes it difficult to ensure that there is an adequate shared analysis of the overall needs and vulnerabilities to be addressed by humanitarian actors" [2]. Furthermore, as humanitarian supply chains have a short shelf life, a volatile environment and a wide diversity of stakeholders, coordination can take many forms. From one operation to another, the nature, number and incentives of stakeholders vary tremendously, and so do the collaboration mode [3]. As a result, most of the time, lack of coordination and collaboration is underlined as a major weakness of humanitarian organizations, even though organizations multiply their attempts at a better coordination system.

To support this endeavor to reinforce humanitarian capacity in terms of disaster management, we propose to use multi agent systems to illustrate the mechanism that actually hinders aid delivery. Indeed, multi-agent systems can be used to make experimental studies on the behavior of numerous heterogeneous entities. Through simulations, we will prove that the lack of collaboration is a major hindrance to the efficiency of humanitarians operations from a global point of view. A model of behavior for each kind of entity (international organizations, local communities, military, etc.) has to be designed in order to simulate the efficiency of the current humanitarian systems. Then, new decision-making criteria will be developed and combined

with notions of the social choice theory to define new behavior, favoring the efficiency of the humanitarian operations from a global point, sometimes to the detriment of the local efficiency. Moreover, information available at this local scale are very limited and the decision-making of each actor must be based only these poor information, but still with the incentive of favoring the efficiency of the whole humanitarian supply chain.

Multi-agent system is also a suitable tool to study dynamic systems. It will be an essential characteristic to evaluate the significance of the decision-making criterion (of each entity) when humanitarian supply chain will be submitted to simultaneous crisis. Re-organization of support operations at a local scale may be required to optimize the distribution of humanitarian aid at a global scale.

Data from humanitarian organizations have already been gathered and many scenarios based on these real data have been established. They will be used to evaluate the new behavior suggested to all communities and actors of the humanitarian supply chain. Thus, we will demonstrate the impact of human behavior in this issue, and propose some trade-offs to improve the situation.

Keywords (3 to 5): Multi-Agent System, Simulation, Supply Chain Management, Optimization, Decision Support Systems,

Publications related to the subject (2 to 3 references):

- [1] Chandes, J. & Paché, G. Investigating humanitarian logistics issues: from operations management to strategic action. *J. of Manuf. Technol. Manage.* 21, 320-340 (2010).
- [2] The International Council of Voluntary Agencies (ICVA). *The Essential Humanitarian Reforms*. Tech. rep. 2008.
- [3] Charles et al. "Collaboration networks involving humanitarian organisations, particular problems for a particular sector", in *IFIP Advances in Information and Communication Technology*, 2010, Volume 336/2010, Eds Luis M. Camarinha-Matos, Xavier Boucher, Hamideh Afsarmanesh. pp 157-165, DOI: 10.1007/978-3-642-15961-9_18



ULL PhD Subject Proposal

Erasmus Mundus cLink Project

Sept.2012 - Sep. 2016 (24 months)

Country: France

University: University Lumiere Lyon 2 (ULL-PHD2)

Laboratory/Department: DISP –Lyon 2 Laboratory

Domain (Computer Science, Management, Economics...): Computer Science
Doctorate Title: Computer Science
Abstract (<i>context of reserach, objectives, methodology... - 1 page min, 2 pages max</i>): Agile platform for Long Term knowledge Retention (LTKR) The aim of this research is to support the integration of knowledge reuse in SME's through the development of long term knowledge retention culture. The proposal of agile and "Bespoke" knowledge system supports small companies in the structuring and archiving for their knowledge for future reuse. The aim goal of this challenge is to accelerate future engineering processes with the enterprise assets of knowledge. The actual research works in the DISP lab cover several archiving dimensions with the proposal of a model based platform using the OAIS reference model. This platform aims to cover the different functionalities expected by a LTKR system. The research work expected in this PhD aims to extend this background to develop new perspectives for our LTKR prototype through : <ul style="list-style-type: none">• The proposal of an analytic process helping SME's to identify the relevant knowledge to archiving• The proposal of a cost analytic process to estimate the cost of the archiving process in the long time perspective• The proposal of an adaptation model to compose the archiving platform according to SME profile• The proposal of the archiving planning mechanisms in adequacy with the archiving model In this research work, several technologies will be used: BPMN, SOA, BPEL, WSDL, etc. and the POC will be developed by Oracle Suite.
Keywords: Knowledge Management, knowledge Retention, OAIS, Model based architecture, BPMN, SOA, BPEL, Ontology based business rules, etc.
Publications related to the subject (<i>2 to 3 references</i>): [KOPeR] Nissan, 2000. An intelligent tool for process redesign: Manufacturing supply chain applications. International Journal of Flexible Manufacturing Systems, 12, 4, Special Issue, 321–339.

[OrgCon] Burton, R.M., and Obel, B. 2004. Strategic Organizational Diagnosis and Design: Developing Theory for Application, 3d ed. Boston, MA: Kluwer.

[ODM 2] Ontology Definition Metamodel, second Revised Submission to OMG/RDF ad/2006-04-13

[CommonKADS] Orsvarn K., Waern A. and Gala S., Olsson O., Hansson H.A., Hook K., Gustavsson R., Holm P., Van de Velde W., Breuker J., Duursma C.: Specifications of CommonKADS – knowledge management and engineering methodology. Swedish Institute of Computer Science, (1993--1995)

[Racer] V. Haarslev, R. Møller, Racer system description. In Goré, R., Leitsch, A., Nipkow, T., eds.: International Joint Conference on Automated Reasoning, IJCAR' 2001, June 18-23, Siena, Italy, Springer-Verlag (2001) 701–705

[Pellet] B. Parsia, E. Sirin, Pellet: An owl dl reasoner. In: Proc. International Semantic Web Conference. (2005)

[FaCT] I. Horrocks, The FaCT System. International conference. on Analytic Tableaux and Related Methods (TABLEAUX'98), pp 307-312, vol 1397, Springer-Verlag, 1998

www.oracle.com/SOA

All references about LTKR: <http://iutcentral.univ-lyon2.fr/LTKR/>



ULL PhD Subject Proposal

Erasmus Mundus Sustainable cLink Project

Sept. 2012 - Sept. 2016 (24 months)

Country: France

University: University Lumiere Lyon 2 (ULL-PHD3)

Laboratory/Department: DISP – MISI Lyon 2 Laboratory

Domain (Computer Science, Management, Economics...): Industrial Engineering

Doctorate Title: Computer Science

Abstract (*context of research, objectives, methodology... - 1 page min, 2 pages max*):

Effective consideration of environmental aspects and risks in product design

Awareness of the environmental impacts of human activity has promoted several initiatives taken in favor of a more sustainable development. One of these initiatives concern changes regarding production and consumption patterns. Companies, under pressure from the government and consumers are beginning to introduce environmental constraints among the criteria to be taken into account in their activities. The product being at the center of their activity, it receives a particular attention from the design phase until the end of its life cycle. This new approach consists in considering environmental constraints as well as other constraints of cost, quality and time in the design phase. This process is known as eco-design. The challenge of the 21st century will be to design and produce products that are more efficient environmentally to ensure their safe use and recycling at the end of their life.

Companies are currently facing a huge need for methods and tools to manage this new dimension and to ensure that they place their products on the market. The product performance depends not only on quality, time and cost but also on the compliance with environmental constraints. This dimension includes normative aspects that greatly complicate the management of products data.

In the industrial area, the use of eco design tools is limited. There is a lack of integration of LCA (Lifecycle Assessment) tools in the normal work environment. Data must be entered in the PDM (Product Data Management), CAD (Computer Aided Design) and the LCA tool. These data can be very dense when it comes to a complex product. This information relates to product data (attributes) and process life cycle (inventory data lifecycle). Data can be historical data on products previously manufactured or marketed or from virtual prototyping and simulations. It must be collected as easily as possible with the fewest mistakes in order to facilitate its use and ensure the quality of the results provided.

During this process, many risks and uncertainties arise. Risks may come from technical, human or organizational aspects. As for uncertainties, according to Dubois and Prade, it has two origins. "It may arise from randomness (often referred to as "objective uncertainty") due to natural variability of observations. Or it may be caused by imprecision (often referred to as "subjective uncertainty") due to a lack of information"

The aim of this thesis is to build a framework to integrate the concepts of risk and uncertainty within the eco-design process. The research objective is to create an information system that will take into account actual risks and uncertainties in the design phase. The PLM tool will be positioned as a communication backbone between the different actors in the eco design approach in order to promote a new concept: the green-PLM or Eco-PLM.

To achieve the objectives of this research work, the candidate must explore the following concepts:

- The concept of Eco design and LCA
- The concept of PLM to manage the product cycle and its environmental profile
- Modeling of different contexts (Compliances and regulations; environmental norms) and their uncertainties.
- The deployment of the Decision Support System to improve the product according to this new paradigm

Keywords (3 to 5): *Environmental impact; Sustainability; Eco Design; Risk management; Norms; Regulations, Models; Decision Support Systems*

Publications related to the subject (2 to 3 references):

- 1/ Tine Herreborg Jørgensen; "Towards more sustainable management systems: through life cycle management and integration" ; JCP, 2007
- 2/ Hong-Bae Jun; Dimitris Kiritsis, Paul Xirouchakis; "Research issues on closed-loop PLM",



PhD Subject Proposal

Erasmus Mundus Sustainable cLink Project

Sept.2012 - Sept. 2016 (24 months)

Country: France
University: University Lumière Lyon 2 (ULL-PHD4)
Laboratory/Department: DISP -Lyon 2 Laboratory

Domain (Computer Science, Management, Economics...): Computer Science
Doctorate Title: Computer Science
Abstract (context of reserach, objectives, methodology... - 1 page min, 2 pages max): <p style="text-align: center;">Agent-based knowledge mangement in social networks.</p> <p>This subject is presented in the context of a project titLed “From data to new knowLedge” reLated to knowLedge management in Large heterogeneous data organizations.</p> <p>KnowLedge management (KM) has become an important topic with the develOpment of information systems. Large amounts of heterogeneous and distributed knowLedge must be processed, shared, reused or maintained. The generation of new knowLedge from very Large heterogeneous organizations aLso becomes an important issue.</p> <p>CurrentLy, most of avaiLabLe architectures for knowLedge management are mainLy centraLized. They tend to ignore that knowLedge is distributed among compLex knowLedge-based organizations. Distributed knowLedge management appears to soLve the issues of distributed knowLedge resources.</p> <p>Our proposaL in this Ph.D. work is to investigate a specific type of organization: social networks. Social networks become fairLy popuLar recentLy and efficient distributed KM is now required. In this purpose, an architecture can be formed from a set of agent communities, where each community is in charge of managing a specific type of knowLedge. The agents can share their knowLedge with other agents or communities. New muLti-agent frameworks must be designed to faciLitae knowLedge sharing among the members of an organization.</p> <p>In order to prove the reLevance of KM measures or to guide their design, KM measures can be evalUated through muLti-agent based simuLations. Indeed, such a tooL can be used to investigate potentialL effects of knowLedge management poLicies on various aspects Like sharing knowLedge in organizations.</p>
Keywords (3 to 5) : MuLti-Agent System, KnowLedge Management, Social Network
Publications related to the subject (2 to 3 references): <p>- R. Abdullah and R. Atan and M.A.A. Murad, <i>aMASK-SM: Multi-agent system based</i></p>

knowledge management system to support knowledge sharing of software maintenance knowledge management", *Journal of Computer and Information Science*, vol. 3, issue 2, 2010.

- R.L. Cross and A. Parker „*The hidden power of social networks*”, *Harvard Business school press Boston 2004*.

- Michael Wooldridge (2009) "An introduction to Multi-Agent Systems" Wiley Ed. May 2009. -

R. Peinl and R. Maier, „*SimKnowledge - Analyzing impact of knowledge management measures on team organizations with multi-agent based simulation*, *Journal of Information Systems Frontiers*, pages 1-16, 2010, Springer.

- D. Choinski, M. Metzger and W. Nocon, „*Hybrid multiagent system for knowledge management in distributed control system*”, *Journal of hybrid artificial intelligent systems*, pages 124-131, 2011, Springer.



PhD Subject Proposal

Erasmus Mundus cLINK Programme

Nov.2012 - Sep. 2015

Country: UK

University: Bournemouth University

Laboratory/Department: School of Design, Engineering and Computing

Domain (Computer Science, Management, Economics...): Computer Science, Engineering, Tourism
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Remark:

1. This document provides the available research projects for the cLINK project PhD and Post-doctorate candidates.
2. Bournemouth University (BU), apart from covering the remaining of the tuition fees, will top-up the third year of the PhD students who are funded by this project and are selected by the BU project committee.
3. BU will will also provide the project Master students an opportunity to study the Master pprogramme (e.g. Master by Research) and award a master degree to the students who pass all the assessment requirements with no-additional charge to the students.

1 Doctorate Title: Forecasting and analysis the impact factors on tourism demand

Abstract: Accurately forecasting and analysis the impact factors on the tourism demand is an important key issue for almost all the industries, such as airlines, hotels, super market. It is wide range of forecasting models in tourism literature, and it is well established on the individual forecasting models, Recently, tourism researchers have demonstrated the efficiency of combination forecasts and the superiority of combination forecasts to individual forecasts in the tourism demand context, where all available individual models are used as inputs for the combinations, linear and nonlinear combinations are available in tourism literature, but this research is still at early stage in tourism research area.

The aim of this project is not only to develop new accurate forecasting models on the tourism demand, but also to select the best inputs for the forecasting models.

For the tourism demand models, the research issues that need to be addressed as follow:

- Evaluate the different data sets by using different individual forecasting model that appear either in tourism or pattern recognition literatures
- Evaluate the different data sets by using different combination forecasting model (linear/nonlinear combination model) that appear either in tourism or pattern recognition literatures
- Analyse impact factors including seasonality impact factor on the tourism demand

For the inputs selections, the research issues that need to be addressed as follow:

- Evaluate the different data sets by using current exiting inputs factors that appear in tourism literature for individual forecasting model
- Evaluate the different data sets by using set of individual models, which are selected by exiting algorithms that appear in tourism literature, as inputs for combination forecasting model
- Developing new optimal subset selection algorithm from all individual models and compares these new algorithms with the existing algorithms and the best individual models.

The outcomes of this project can provide the better review for the tourism researchers on the accuracy of tourism demand forecasting models, and will apply the most powerful techniques as forecasting tourism demand models. It is very important for the planning Olympic 2012 event, and accuracy forecasting EU arrival to UK in the next couple of years. The outcomes of this project can also be used in any tourism industries and Governments.

Keywords: *tourism demand forecasting, combination forecasts, Optimal subset selection.*

Publications related to the subject:

- [1] S. Cang and H. Yu, Cluster Analysis for Multi-Class with High-Dimensional Data. International Conference of Institute of Automation, UK, Sept. 2004.
- [2] S. Cang and H. Yu, Novel Probability Neural Networks for Classification Problems. Journal of IEE Vision, Image and Signal Processing. Vol. 152, No. 5, p535-544, 2005.
- [3] S. Cang (2011). A Nonlinear Tourism Demand Forecast Combination Model. Tourism Economics. Forthcoming.
- [4] Cang, S., 2009. Expectation Maximization Algorithm Cluster Analysis for UK National Trust Visitors. Tourism Analysis, 14 (5), pp. 637-650.

2 Doctorate Title: Investigation of forecasting and classification techniques and their applications in tourism demand

Abstract : Intend (recommended to others) to revisit to Country/City/Hotel and why they choose this hotel/destination are important issues for Hotel and Tourism development, understanding the customer perceptions and why they would like/dislike to come again is the key information for the hotel policy management and tourism business running. Also can provide useful information to the Government on the decision maker.

This research aims to provide an analysis of the factors that influence, and thereby impact on, customer intention either repeat visits to hotel or country/city. There are many factors that potentially influence a customer's decision

on whether or not to make a repeat visit. These factors include such as past experiences, perceived constraints, attitudes, satisfaction, experiential destination image, destination image and location. In more details, each of these factors have many components, for example, satisfaction consists of service, facilities, food and drink, hotel rooms, image of hotel, reception, security and so on. The relationship between, and how importance of, these factors will be investigated in this project.

There are common models that are well applied in the tourism research area, such as Factor analysis, K-means, Logistic Regression models and Neural Networks, but the research in this area is still in its early stage in tourism literature, thus there are still many challenging research issues to be solved in order to fully understand the reasons for and against repeat visits. More efficient models from pattern recognition area can be adopted and make the comparisons with the existing models in tourism literature.

The key issue is that it may be obtain the accuracy results if using advanced model such as Bayesian technique and Neural Networks, but it is difficult to understand the customer perceptions due to the natural of these models which are black boxes. However, it is easily to understand customer perceptions if apply CHAID or other decision trees, but it may be not achieving accuracy results.

The research program may consist of literature survey, identifying the challenging research issues, developing a theory framework, designing questionnaire, conducting a pilot study, conducting empirical survey, analysing the data using common techniques and developing new models, and fully understand the customer perceptions. This developing from theoretic to practice can contribute to the development of quantitative analysis within the field of tourism. Also can provide useful advance for the hotel or tourism business management.

Keywords: Customer perceptions, *Visit intention; Factor Analysis; CHAID Analysis; Bayesian Technique*

Publications related to the subject:

- [1] S. Cang and H. Yu, Cluster Analysis for Multi-Class with High-Dimensional Data. International Conference of Institute of Automation, UK, Sept. 2004.
- [2] S. Cang and H. Yu, Novel Probability Neural Networks for Classification Problems. Journal of IEE Vision, Image and Signal Processing. Vol. 152, No. 5, p535-544, 2005.
- [3] Cang, S., 2009. Expectation Maximization Algorithm Cluster Analysis for UK National Trust Visitors. Tourism Analysis, 14 (5), pp. 637-650.

3 Doctorate Title: Optimisation of Hospital theatre scheduling and resource utilization using real-time data capture and intelligent decision making

Abstract : This project aims to investigate an innovative use of an existing data capture technology from manufacture supply chain management and the other sectors to meet an existing or emerging healthcare needs from the project collaborator. And the second aim is to identify the barriers that would need to be overcome before implementation.

RFID as a candidate data capture device is currently investigated by the team in the applications of healthcare. RFID itself is not new but enhancements in technology have made RFID very important in a number of areas such as, resource optimization, increasing efficiency within organizational processes, providing enhance customer care, making better overall organizational operations and improving healthcare.

However, designing RFID solutions and applications in a healthcare scenario is a very difficult task due to the complex organizational setting such as hospital combined with sensitivity of human involvement. Moreover, assessment of potential benefit from RFID applications in healthcare can be complex. One of objectives in this research project is to explore RFID in connection to healthcare and analyse the RFID applications for healthcare settings.

The RFID technology will be used for patient tracking to optimize patient flows, reduce wait times in waiting rooms and improve patient satisfaction. A small RFID tag on a patient wristband emits a radio wave that is detected by a network of receivers around the hospital. The system graphically displays the locations on a virtual map of the facility, or in a table view or into a hospital information system. RFID technology for patient tracking improves and streamlines patient care processes by coordinating crucial events from patient admission to discharge processes, all

while improving patient safety by giving hospital staff the real-time data and task coordination tools required to improve patient care.

Keywords: *Real-time data capture, data analysis, intelligent decision making, healthcare*

Publications related to the subject:

1. “RFID Technology in Intelligent Tracking Systems in Construction Waste Logistics using Optimisation Techniques,” L Zhang, A S Atkins, H Yu, 4th SKIMA (International Conference of Software, Knowledge and Information on Management Applications), August 25-27, 2010 - Paro, Bhutan
2. “Document Management System Using Wireless RFID technology for Intelligent Healthcare Operations,” Saisakul Chernbumroong, Anthony Atkins, Hongnian Yu, *Proceeding of the IADIS International Conference e-Health 2010*, Freiburg, Germany 2010.
3. “Visual Simulation-based Hospital Theatre Management System”, Xin Zheng, Hongnian Yu, and Anthony Atkins, 4th SKIMA (International Conference of Software, Knowledge and Information on Management Applications), August 25-27, 2010 - Paro, Bhutan

4 Doctorate Title: AUTOMATED COST-FUNCTION-BASED DECISION MAKING FOR MANUFACTURING SUPPLY CHAINS

Abstract: The manufacturing enterprise has been traditionally viewed as a sequential arrangement of functions such as design, manufacture, R&D, marketing, and finance. The recent trend has been to view manufacturing as a collection of value-delivering business processes. A manufacturing supply chain (MSC) is an integrated set of business functions, encompassing all the activities from raw material acquisition to final customer.

Although many efforts have been made in the past three decades, it is remarkable that most industrial firms attempt to increase their productivity and/or solve their production problems by trial-and-error, using a manual production scheduling method based on experience and interpretation of real-time situations. This has been confirmed from the industry partners in the exemplar industrial research projects. Such an approach is costly and often not effective. They have realised that this is not capable of efficiently scheduling the complex and varied operations involved in the manufacturing process and that it is difficult using this method to gauge actual capacities and the effects of re-scheduling, in response to customer demands or other random disturbances, all the way down from materials supply to delivery. An alternative approach to obtaining productivity improvement and technology innovation is a systematic evaluation of causality of manufacturing problems through simulation.

WITNESS, like many other of this type of simulation software, employs ‘what-if’ analysis methods to support decision-makers at both the operational and strategic levels. However, it has a number of limitations. The proposed research aims to overcome the above shortcomings by developing, and adding to WITNESS, new generic modelling and optimisation functionality. These would take the form of a generic net (GN) modelling toolbox and an AI-based optimisation toolbox to enhance the decision power. This would allow AI-based search techniques, employing decision-making heuristics, to be implemented on the GN toolbox seeking to satisfy MSC or production system cost functions selected by the WITNESS user. A GN consists of one or more ‘kernel’ Petri nets (PNs) embedded in an object-oriented nodal structure.

Petri nets (PNs) have gained more and more attention in the manufacturing community due to their graphical and mathematical advantages over traditional tools dealing with discrete event dynamics and characteristics of complex systems. A significant advantage of PNs is that they can model shared resources, routing flexibility, lot sizes, synchronisation, and concurrency. By modelling these features up front, a schedule or plan can be obtained that avoids deadlocks which cause chaos in a real system. Another unique feature of the PN-based scheduling approach is that the resulting schedule is event driven, i.e., the schedule responds to events. Most existing scheduling methods can be considered as time driven since the schedule is a list of times at which certain activities are to occur. By using the event-driven philosophy, the schedule focuses on the precedence constraints and is more tolerant of disturbances.

It is well known in the scheduling literature that the general job shop problem is NP-hard, for which no efficient algorithm exists for solving the scheduling problem optimally in polynomial time. Therefore we use genetic

algorithms (GA) and heuristic AI in an attempt to solve the problem.

The objectives of the research are:

- To provide a generic GN-based modelling, optimisation and scheduling framework suitable for integrating with commercial simulation programs to improve the decision-making processes for discrete-event dynamic systems in general and for MS and MSC in particular.
- To provide GN-based modelling, optimisation and scheduling functionalities for MS and MSC in the form of generic toolboxes and to develop a generic linking mechanism which will enable the toolboxes to be integrated with the particular commercial simulation program WITNESS.
- To make the next generation simulation-based software more adaptable than the current generation of simulation tools.
- To model and evaluate the effects of MS and MSC dynamics and perturbations on the re-scheduling of the associated production system and to improve the re-scheduling response times.

Keywords: *Petri net, manufacturing supply chains, intelligent decision making, scheduling*

Publications related to the subject:

1. "Combined Petri Net Modelling and AI Based Heuristic Hybrid Search for Flexible Manufacturing Systems--- Part II Heuristic Hybrid Search," H Yu, A Reyes, S Cang and S Lloyd, *Journal of Computers & Industrial Engineering*, 44, 545-566, 2003.
2. "A transferring approach – from a Witness model to a Petri net," X Zheng, H Yu and A Atkins, *Proceedings of the 13th International Conference on Automation and Computing*, Stafford, UK, pp 232-236, 15 September, 2007.
3. "A Simulation-based Dispatching Optimisation Algorithm in Batch Scheduling", Xin Zheng, Hongnian Yu, and Anthony Atkins, *Proceedings of the SKIMA Conference*, Fes, Morocco, 21-23 October, 2009.

4 Doctorate Title: Investigating and development of miniature Robots for minimal invasive surgery

Abstract : Traditional open surgery requires large opening to enable the surgeon to see and place fingers and instruments into the region of interest. It causes additional injury while gaining access to the region to perform surgical procedures. This procedures result more pain, longer recovery times and increased morbidity. Emerging technologies such as advanced laparoscopes, clip applicators, energy sources, robotics etc. evolving from early 1990's, enabled minimal invasive surgery to be an alternative of traditional surgery. Laparoscopy, a minimally invasive abdominal surgery, performed with long tools inserted through small incisions, has become the choice of interventions for many commonly performed interventions. It results shorter hospital stays, less pain, more rapid return to daily work, improved immunological response compare to the conventional surgery.

However laparoscopic surgery does not allow the surgeon to view or touch the surgical environment directly and they constrain the motion of the endpoint of the tools and cameras to spherical arcs whose centre is the insertion point. Vision limitations are significant because the current field of view cannot encompass the frequent changes of instruments as they pass through the abdominal cavity.

Several in vivo devices have been developed to assist during surgical procedures. The Heart lander robot was developed to crawl on the heart during cardiac surgery [8], while other locomotion devices have been designed to assist with gastrointestinal procedures. These devices address different problem than those of the abdominal cavity. The Heart lander robot was designed to provide a stabilized platform for heart manipulation. Robots designed to navigate the gastrointestinal tract are confined to a tube, which is used to assist motion. Initial work has begun to address abdominal in vivo robotic manipulators and visual feedback. Several fixed base prototype in vivo camera robots have been used during porcine cholecystectomies to provide the surgeon with additional visual feedback.

This project aims to develop in vivo robots for minimally invasive abdominal surgery to address the issues of laparoscopic surgery and robot-assisted laparoscopic surgery.

The objectives of this research project are:

- To review the current state of the art of miniature robots and their medical applications
- To investigate the latest technologies and methodologies for developing a micro-medical surgery robot.
- To propose design for a novel micro surgery robot.
- To develop modelling, design and control approaches of the proposed micro surgery robot.
- To conduct simulation and validation.
- To develop a prototype to demonstrate the new ideas and methods.

Keywords: *miniature robots, micro surgery robots, modelling and control, minimal invasive surgery*

Publications related to the subject:

1. "Closed-loop Tracking Control of a Pendulum-driven Cart-pole Underactuated System," H Yu and Y Liu, Proceedings of the Institution of Mechanical Engineers, Part I, Journal of Systems and Control Engineering, 2008.
2. "Analysis and Control of a Capsbot," Y Liu, H Yu and T C Yang, Proceedings of the 17th IFAC World Congress, Seoul, 6-11 July, 2008.
3. "Miniature in vivo robots for remote and harsh environments," M. Rentschler, S. Platt, K. Berg, J. Dumpert, D. Oleynikov, and S. Farritor, IEEE Transactions on Information Technology in Biomedicine, vol. 12, no. 1, pp. 66–75, 2008.

5 Doctorate Title: Real-time wireless control of locomotion systems using adaptive/robust control approaches

Abstract: The project aims to investigate the current challenging issues of unmanned mobile robots which move in the uncertainty environment for example, agriculture robots, robots walking in the rough and rugged terrain, etc. . The unmanned mobile robot should be remotely controllable by the human operators in the remote location.

The project objectives:

- 1) To investigate the challenging issues of real-time wireless control of locomotion systems
- 2) To build on the expertise in control theory, modelling and robot technology to provide improved gait/locomotion control
- 3) To verify the potential of the outcomes by tests on robotic systems

Motivation:

- 1 New and developing theories of adaptive and robust control create a new platform to consider substantial improvements in pure locomotion (regarded as a repetitive or periodic process) and a control theoretical framework to consider aspects of
 - Learning (from experience and failure)
 - Coping with environmental variations through robustness and disturbance rejection
 - Adapting to new environmental parameters or loads
- 2 The capability to control mobile robots wirelessly in real-time is a challenging issue. Wireless mobile robots which can react speedily have many applications, such as medical diagnosis, inspection of underground water pipes, disaster inspection, etc. The project will investigate
 - The communication mechanism of real-time wireless mobile robots
 - Modelling of real-time wireless mobile robots from both control and network communication angles
 - Adaptive learning approaches considering wireless network issues

Keywords: *mobile robot, real-time wireless communication, adaptive and robust control*

Publications related to the subject:

1. "Variable Structure Adaptive Control of Robot Manipulators," H Yu and S Lloyd, Institute of Electrical and Electronic Engineers, Journal of Control Theory and Applications, pp. 167-176, Vol. 144, No. 2, 1997.
2. "Model Reference Parametric Adaptive Iterative Learning Control," H Yu, M Deng, TC Yang and DH Owens, 15th IFAC World Congress on Automatic Control, BARCELONA, Spain, 21-26 July, 2002.
3. "Co-simulation of Wireless Networked Control Systems over Mobile Ad-hoc Network using SIMULINK and OPNET", M S Hasan, H Yu, A Griffiths and T C Yang, IET Communications, Volume 3, Issue 8, p. 1297-1310, August 2009

4. "Modelling and Remote Control of an Excavator", Yang Liu, and Mohammad S Hasan and Hongnian Yu, International Journal of Automation and Computing, Vol. 7(3), August 2010, pp. 349-358

6 Doctorate Title: A Route Recommendation System for Tourists in IoT Environment

Abstract : The internet of things (IoT) (Vermesan, 2011) is a relative new development in ICT, and is gaining worldwide recognition as a key concept with applications in smart cities, assisted living, eHealth, intelligent manufacturing, intelligent transport and logistics, and intelligent service. It was identified as one of six enabling technologies with potential impacts on US interests by 2025 (NIC, 2008). The IoT architecture proposed by Swan (2012) has four layers: 1) Hardware sensor platform for data acquisition, 2) software processing for information creation, 3) information visualisation (presentation) for users understanding, 4) action taking for user interactions. However, this architecture is still in the concept stage, and IoT itself is still at the research and demonstration stage and several of key technologies are under research and development. Currently most researches are motivated by applications (Swan 2012; Vermesan, 2011). Applying the IoT concept in tourism decision making which is novel is an attractive research area and may provide timely and economic impacts to the tourism industry.

This project aims to investigate the needs and preferences of tourists based on secondary research (literature survey) and primary research (questionnaire) when they are visiting a hot spot, e.g. Alton Towers (UK Theme Park), Zoo (Choosri, 2010), and to develop an intelligent route recommendation system to provide the recommended visiting places and sequences for on-site tourists based on their criteria (e.g. available time, personal interests, demographic information, situations of on-site visiting places and environment impacts such as weather, etc.). However, to achieve this, an IoT based system will generate and bring massive data, and most data flows are completed new (i.e. created first time). The research question is how to handle a large volume of information (data) which is one of challenging issues in IoT research. To address this question, it is required an approach with capability of modelling, identifying, searching, retrieving, aggregating and delivering information requested by tourists (Vermesan, 2011) (Swan 2012). The proposed project is to address the above question by developing new algorithms/models for the route recommendation system, and validating the efficiency and accuracy through case studies in IoT environment.

The project will be conducted using the combination of qualitative and quantitative approaches. The expected deliverables of the project are an IoT based route recommendation architecture, a dynamic route modelling approach based on the pilot site map, feature selection and classification approaches, an AI based decision making algorithm for the proposed route recommendation system to the tourists, and an evaluation analysis report. Three conference and 2 journal papers will be produced during the life time of this project. An ideal candidate should have a computing, data processing and analysis background due to the requirement on handling a large data set.

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- Choosri N., Chernbumroong S., Intaya S., Singjai A., Atkins A. and Yu H, (2010) Zoo application of RFID technology: a case study of Chiang Mai Zoo, Thailand, (Best paper award) 4th SKIMA, Bhutan.

Keywords: *Road recommendation, Internet of things, Tourism,*

Publications related to the subject:

1. Saisakul Chernbumroong, Shuang Cang, Anthony Atkins and Hongnian Yu, "Detection of Activities of Daily Livings of Elderly Person Using Wrist-Worn Multi-Sensors," International Journal of Expert Systems with Applications, 40(5):1662-1674 2013.
2. Shuang Cang and Hongnian Yu, "Mutual Information Based Input Feature Selection for Classification Problems", Decision Support Systems, Volume 54, Issue 1, December 2012, Pages 691-698.
3. Lizong Zhang, Anthony Atkins, and Hongnian Yu 'Smart Hospital System for Tradition Chinese Medicine Trials using RFID in IoT Environment', 2012 International Conference of Software, Knowledge and Information on Management Applications, 9-11 September 2012 Chengdu, China.

7 Doctorate Title: Privacy and Security Protection of RFID Data for Tourist Locations

Abstract: Radio Frequency Identification (RFID), described as an 'emerging technology' which provides opportunity for SMEs (Small and Medium Enterprises), is used in many industries and business sectors (<http://ukrfid.innoware.co.uk/>). RFID can be used for helping to identify, track, trace, audit, control, and locate business assets. Recently, RFID has being adopted in the tourism industry for a wide range of applications, e.g. hotels, wine cellars, theme parks, cruise ships, museum, festivals etc. to enhance the business operations and improve services for guests (Hozak 2012, Adu 2010). However, the applications of RFID technology introduce various privacy and security threats in commercial operations (Morshed 2012). The unique identification number of an RFID tag may cause several privacy and security threats such as information leakage of a tag, traceability of tourists, denial of service attack, and impersonation of a tag etc. Therefore, it is important to identify the challenging issues of privacy and security protection of RFID data faced in the tourism industry, and to provide strong security but offer location tracking using RFID systems within a group of tourists.

The aim of this project is to design and develop a secure and location privacy aware RFID system suitable for tourist locations. Under the proposed system, passive tags can be equipped with additional hardware to support encryption e.g. Advanced Encryption Standard based communication to maintain security. The members within a group, e.g. one family or a group in a tourist location, will be able to track each other while maintaining the complete location privacy from other groups. The objectives of this research are:

- To investigate the current applications of RFID technology in the tourism industry;
- To identify and evaluate the issues on security and location privacy in RFID systems adopted in the tourism industry;
- To design power efficient hardware suitable for security and location privacy within a group.
- To develop protocol(s) to maintain security and location privacy within a group.
- To conduct hardware simulation and/or real world implementation for the verification of the proposed RFID system.
- To test and validate the proposed methods

The deliverables of the proposed project are a report on existing research works on applications of RFID technology in the tourism industry, a simulation model for the proposed RFID system with encryption capabilities, an improved security and location privacy protocol, a real world system model, and three conference papers and two REFABLE journal papers.

References

1. Hozak K. (2012), Management Guidance for Applying RFID in the Tourism Industry. Interdisciplinary Journal of Contemporary Research in Business, Vol. 4, No. 2, p18-28.
2. Morshed M.M. (2012), Effective Protocols for Privacy and Security in RFID Systems Applications. PhD dissertation, Staffordshire University.
3. Adu O.B., Atkins A.S., Yu. H., and Nix L.D (2010), Integrated Information Systems Using Emerging RFID Technology in the Hospitality Industry, 4th SKIMA, August 25-27. Paro, Bhutan.

Keywords: *RFID, Security, Tourism,*

Publications related to the subject:

1. Saisakul Chernbumroong, Shuang Cang, Anthony Atkins and Hongnian Yu, "Detection of Activities of Daily Livings of Elderly Person Using Wrist-Worn Multi-Sensors," International Journal of Expert Systems with Applications, 40(5):1662-1674 2013.
2. Shuang Cang and Hongnian Yu, "Mutual Information Based Input Feature Selection for Classification Problems", Decision Support Systems, Volume 54, Issue 1, December 2012, Pages 691-698.
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8. Chenchu, Champion J., and Yu H., (2011) The Effect of Metallic Substance on the Read Range of UHF Passive RFID System. Proceedings of the 17th International Conference on Automation & Computing, University of Huddersfield, UK, p275-279, 10 September.

8 Doctorate Title: Design, modelling and control of a hybrid legged-wheel robot with applications in rescue tasks

Abstract: This project aims to investigate the challenges and prospects of autonomous mobile robots in rescue and recovery operations in hazardous environments/ rough terrains. Practically the project will design and develop an autonomous legged-wheeled robot with intelligent path-planning and behaviour-based control system. For travelling on the uneven, difficult and rough terrain, a legged robot is the best option. For the even ground which the robot is required to move fast and efficiently, a wheeled robot is the best option. The proposed hybrid legged-wheeled robot will have both capabilities. The hybrid robot has the ability to determine which motion mode to be used based on the task and environment.

The project will investigate the challenges, prospects and needs through intensive literature survey. Based on the survey results, a hybrid legged-wheeled robot will be designed and prototyped. Modelling, simulation and control of the proposed robot will be conducted using the Euler-Lagrange approach, Matlab, and the advanced control technology. One of the challenges in this work is to develop a robust switch system which can make the robot switch between the legged mode and wheel mode based on the environment and the needs.

The related work has been conducting by a recently EU funded project (Real-time adaptive networked control of rescue robots) under the Marie Curie (International Research Staff Exchange Scheme) programme. The candidate will collaborate with and benefit from the strong research team who is working on this project. The project has multiple partners from China, Romania and UK.

The expected deliverables of this potentially high profile project are a legged-wheeled robot design, a legged-wheeled robot prototype, a hybrid model of the proposed robot, simulation environment, control strategies, and an evaluation analysis report. Three conference and two journal papers will be produced during the life time of this project. An ideal candidate should have a computing, or engineering, or mathematics or mechatronics background due to the requirement on handling a task which required multidiscipline knowledge.

Keywords: Mobile robots, legged robots, wheel robots, modelling, robot control, autonomous systems, networked robots

Publications related to the subject:

1. Yang Liu and Hongnian Yu, "Survey of Underactuated Mechanical Systems", IET Control Theory Applications, 2013 (in print)
2. Yang Liu, Marian Wiercigroch, Ekaterina Pavlovskaja, and Hongnian Yu, "Modelling of a Vibro-Impact Capsule System", International Journal of Mechanical Sciences, Volume 66, January 2013, Pages 2–11.
3. Yang Liu, Hongnian Yu, and Shuang Cang, "Modelling and Motion Control of a Double-Pendulum Driven Cart", IMechE-part I–Journal of systems and control engineering, Vol.226, pp. 175-187,2012.
4. M. Nazmul Huda and Hongnian Yu, and Michael Goodwin, "Experimental Study of a Capsule for Two Dimensional Movements", (Best student paper award) the 2012 UK Automatic Control Conference, 3-5 September 2012, Cardiff, UK
5. Keattikorn Samarngoon and Hongnian Yu, "Real time Virtual Simulation of Underactuated Pendulum-Driven Capsule System", the 2012 UK Automatic Control Conference, 3-5 September 2012, Cardiff, UK
6. Hongnian Yu, David Owens, Robert Parkin, "Special Issue on Human Adaptive Mechatronics", IMechE-Part I: Journal of Systems and Control Engineering, September 2011 225: 705-708.

7. Jianzheng Zhang, Feng Gao, Hongnian Yu, and Xianchao Zhao, "Design and Development of a Novel Redundant and Fault Tolerant Actuator Unit for Heavy-duty Parallel Manipulators", IMechE- Part C: Journal of Mechanical Engineering Science, 225 (12), pp.3031-3044, 2011
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9. Yang Liu, Hongnian Yu, Luige Vladareanu, Shuang Cang, and T. C. Yang, "Trajectory Optimization of a Pendulum-Driven Underactuated Cart", SISOM 2011 and Session of the Commission of Acoustics, pp 287-299, Bucharest 25-26 May, 2011
10. M. Nazmul Huda and Hongnian Yu, "Modelling and Motion Control of a Novel Double Parallel Mass Capsbot," the 18th IFAC World Congress, Milano (Italy), pp. 8120-8125, August 28 - September 2, 2011
11. M S Hasan, H Yu, A Griffiths and T C Yang, "Co-simulation of Wireless Networked Control Systems over Mobile Ad-hoc Network using SIMULINK and OPNET", IET Communications, Volume 3, Issue 8, p. 1297-1310, August 2009 .
12. Hongnian Yu, Hiroshi Inaba, David H. Owens and Katsuhisa Furuta, "Special Issue on Human Adaptive Mechatronics", International Journal of Modelling, Identification and Control, Vol. 4, No. 4, 2008.
13. H Yu, Y Liu, and T.C. Yang "Closed-loop Tracking Control of a Pendulum-driven Cart-pole Underactuated System," Proceedings of the Institution of Mechanical Engineers, Part I, Journal of Systems and Control Engineering, 2008.

1 PD Title: Mobile Robots and Human Adaptive Mechatronics

Abstract: This project is built on our recent £160k EPSRC-funded Human Adaptive Mechatronics project (www.EPSRCHAM.org) which includes seven national and seven international collaborators. This project has attracted a national and international reputation in this research area. The project team has: organised one workshop and three invited sessions on HAM in international conferences - such as IEEE, UKACC; organised two special issues on HAM in two international journals; published over 50 conference and journals papers. The SU team with JCB - a UK based excavator developer presented a physical demonstration in an exhibition hosted by Sellafield - a UK based nuclear decommissioning company, where ten universities and fourteen companies in robotics made the presentations. The demonstration system made by the SU team involved a dummy excavator, an observer robot being controlled over a Mobile Ad-hoc Network (MANET). The MFC team has strong international collaborations, such as Japan, China, Romania and Italy, in this research area. The postdoctor on this project is required to contribute the followings:

- To carry out a high level of research in areas related to mobile robots and human adaptive mechatronics
- To develop collaboration and partnership with key stakeholders and researchers nationally and internationally
- To work with the team and disseminate research through peer reviewed journals, presentation at conferences, seminars, workshops, reports and toolkits
- To manage research projects ie design appropriate trials and other methods, ensuring compliance with regulatory requirements (research governance and ethical issues), co-ordinate data collection and analysis
- To help supervise the E-Tourism PhD, MRes and BSc projects

The Postdoctor should have:

- Possession of a PhD degree in a relevant area
- A commitment to research, scholarship and learning
- Evidence of research publications and outputs
- Experience of research with expertise in qualitative and quantitative research
- Awareness of a range of methodological issues
- Ability and experience in carrying out the required academic research in a logical and rigorous manner within agreed timescales
- Ability to present complex information in a clear and logical manner and to draft research reports
- Demonstrable ability to initiate and develop successful research bids/funding applications

Keywords: *Mobile robots, Human adaptive mechatronics, intelligent control*

Publications related to the subject:

1. “Review of modelling and remote control for excavators”, Hongnian Yu, Yang Liu, and Mohammad S Hasan, International Journal of Advanced Mechatronics Systems, Vol. 2, No.1/2 pp. 68 – 80, 2010
2. “Special Issue on Human Adaptive Mechatronics”, Hongnian Yu, Hiroshi Inaba, David H. Owens and Katsuhisa Furuta, International Journal of Modelling, Identification and Control, Vol. 4, No. 4, 2008.
3. “Special Issue on the Research Conducted in Robotics and Intelligent Machines”, H Yu and H Inaba, International Journal of Automation and Computing, Vol. 3, 2006

2 PD Title: Intelligent Mobile and Wireless Sensor Technology

Abstract: The objectives of the project are:

- To focus on technologies, solutions and possibilities associated with the use and deployment of sensor technologies and their integration with embedded technology and systems.
- To provide computing and engineering solutions that require an element of remote or mobile sensor technologies, and an increasing need for the integration of sensors and mobile technology for data acquisition and control.

The research includes wireless networked control systems across mobile ad-hoc networks as and their quality of service. The ability to control a remote device in an environment that is dangerous to humans, this will be done via transmitted video images back to the users for them to control the device from a safe location. The postdoctor on this project is required to contribute the followings:

- To carry out a high level of research in areas related to intelligent mobile and wireless sensor technology
- To develop collaboration and partnership with key stakeholders and researchers nationally and internationally
- To work with the team and disseminate research through peer reviewed journals, presentation at conferences, seminars, workshops, reports and toolkits
- To manage research projects ie design appropriate trials and other methods, ensuring compliance with regulatory requirements (research governance and ethical issues), co-ordinate data collection and analysis
- To help supervise the E-Tourism PhD, MRes and BSc projects

The Postdoctor should have:

- Possession of a PhD degree in a relevant area
- A commitment to research, scholarship and learning
- Evidence of research publications and outputs
- Experience of research with expertise in qualitative and quantitative research
- Awareness of a range of methodological issues
- Ability and experience in carrying out the required academic research in a logical and rigorous manner within agreed timescales
- Ability to present complex information in a clear and logical manner and to draft research reports
- Demonstrable ability to initiate and develop successful research bids/funding applications

Keywords: *Wireless Networked Control Systems, Wireless Sensor Networks, mobile data capture technology*

Publications related to the subject:

1. “Co-simulation of Wireless Networked Control Systems over Mobile Ad-hoc Network using SIMULINK and OPNET”, M S Hasan, H Yu, A Griffiths and T C Yang, IET Communications, Volume 3, Issue 8, p. 1297-1310, August 2009
2. “Networked Control Systems: A Historical Review and Current Research Topics”, TC Yang, H Yu, M R Fei and L X Li, The journal of Measurement and Control, Vol 38/1, 12-16, 2005

3. - "Networked Control System: A Brief Survey," T. C. Yang, IEE Proceedings - Control Theory and Applications, vol. 153, pp. 403-412, 2006.

3 PD Title: Intelligent Tracking and Auditing Systems in Environment, Manufacturing, Supply Chains, and Logistics

Abstract: The project on Intelligent Tracking and Auditing Systems in Environment, Manufacturing, Supply Chains and Logistics is built on our EPSRC-funded CTA project and EASTWEST Asia-Link project in Information Engineering System Technology. (<http://eastwest.inf.brad.ac.uk/>), and the currently running EU funded 5.5 m Euro eLINK project. Currently five PhD students and a MRes researcher and a number of Erasmus students are working in this area by collaborating with three local companies and, Liverpool University, Shanghai Jiaotong University, and Chiangmai University (Thailand). This project has strong industry collaboration (through the CTA project) and international collaboration (through the EPSRC network project).

The project covers three main areas:

- 1) Real-time data capture such as RFID – this includes selections of the right devices and integration of them for the specific applications
- 2) Intelligent decision making systems – this includes optimisation, AI, simulation, intelligent database, etc
- 3) Integrating 1) and 2) to develop a holistic real-time system

The postdoctor on this project is required to contribute the followings:

- To carry out a high level of research in areas related to data capture, supply chains and logistics
- To develop collaboration and partnership with key stakeholders and researchers nationally and internationally
- To work with the team and disseminate research through peer reviewed journals, presentation at conferences, seminars, workshops, reports and toolkits
- To manage research projects ie design appropriate trials and other methods, ensuring compliance with regulatory requirements (research governance and ethical issues), co-ordinate data collection and analysis
- To help supervise the E-Tourism PhD, MRes and BSc projects

The Postdoctor should have:

- Possession of a PhD degree in a relevant area
- A commitment to research, scholarship and learning
- Evidence of research publications and outputs
- Experience of research with expertise in qualitative and quantitative research
- Awareness of a range of methodological issues
- Ability and experience in carrying out the required academic research in a logical and rigorous manner within agreed timescales
- Ability to present complex information in a clear and logical manner and to draft research reports
- Demonstrable ability to initiate and develop successful research bids/funding applications

Keywords: *real-time data capture, supply chains, logistics, simulation, optimisation*

Publications related to the subject:

- 1) "Integrated Wireless Information Technologies for Improving Agriculture Transport Logistics in Thailand", Noppon Choosri, Hongnian Yu and A. S. Atkins, International Journal of Computing Science and Communication Technologies, 2009
- 2) "A Simulation-based Dispatching Optimisation Algorithm in Batch Scheduling", Xin Zheng, Hongnian Yu, and Anthony Atkins, Proceedings of the SKIMA Conference, Fes, Morocco, 21-23 October, 2009.
- 3) "RFID Technology in Supply Chain Logistics Applications," N Choosri, H Yu and A Atkins, the SKIMA Conference, Kathmandu, Nepal, 18-21 March, 2008.