

Christopher Gwilliams

Cardiff University
School of Computer Science and Informatics
Queens Buildings
Cardiff, CF24 3AA

Phone: 07725117838
Email: scm7cg@cs.cf.ac.uk
Homepage: www.encima.co.uk
Github: www.github.com/encima

Education

2010-Present: *PhD in Computer Science, Cardiff University*

Using Local and Global Knowledge in Wireless Sensor Networks (Funded by the EPSRC)

Supervisors: Prof. Alun Preece and Mr. Alex Hardisty

Research Synopsis

My work focussed on the use of local and global knowledge in wireless sensor networks (WSNs). We define local knowledge as knowledge that has been gained, by an expert, through experience and/or experimentation; global knowledge is knowledge that is readily available to all. An example of this is the sleeping pattern of an animal: local knowledge is that the sleeping patterns of the animal vary depending on resource availability whereas the global knowledge could be that the animal is nocturnal. Through the use of this local knowledge, we would know to look for that animal at different times, depending on the observed availability of prey throughout the year.

We believe that this knowledge can be encoded into WSNs in order to make informed routing decisions on the data collected. More importantly, we believe that, using sensing devices with increased knowledge-processing capabilities, the profit is increased; where profit is the value of the sensed data received by the end user.

In order to demonstrate this, we have used a variety of technologies, such as:

1. Drools - A Java-based rule management system with a forward chaining inference based rule engine. We use this throughout the WSN in order to process sensed data based on the knowledge stored within its knowledge base. As new data is received, the knowledge base is dynamically updated based on the contents of the data.
2. Global Sensor Networks (GSN) - A Java-based sensor middleware that allows the description of sensors through XML files and providing a web-based front end to view the sensed data. We use GSN to add each sensing device and to control the sending and receiving of sensed data within the network.
3. Node.JS - A javascript platform used to build network applications. Node.JS provides an interface to the data held by GSN, as well as an interface to control the Drools rule engine and add new data into the network. We have also implemented APIs in Node that direct manipulation of the rule engine.

2007-2010: BSc(Hons) in Computer Science, Cardiff University**Individual Project: An Automated Helpdesk Application for the Resolution of Hardware and Software Faults in an I.T. Support Company**

Publications

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| 2012 | <p>Christopher Gwilliams, Alun Preece, Alex Hardisty, Benoit Goossens, and Laurentius N Ambu. Local and global knowledge to improve the quality of sensed data</p> <p>Christopher Gwilliams, Alun Preece, Alex Hardisty, Benoit Goossens, and Laurentius Ambu. K-HAS: An architecture for using local and global knowledge in wireless sensor networks. In <i>The International Conference on Informatics and Applications (ICIA2012)</i>, pages 331–341. The Society of Digital Information and Wireless Communication, 2012</p> |
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Posters

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| 2012 | <p>Christopher Gwilliams, Alun Preece, and Alex Hardisty. Poster: Using local and global knowledge in wireless sensor networks. In <i>Proceedings of the 10th international conference on Mobile systems, applications, and services</i>, pages 515–516. ACM, 2012</p> |
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Research & Professional Experience

- 2010-2013: **Teaching Assistant.** Teaching a range of courses for both undergraduates and Masters students, including, but not limited to: Web development and APIs, Relational and Object-Relational Databases, Mobile App Development and Software Development Practises. Recognised as an Associate Fellow of the HEA.
- 2010-2013: **Supervisor.** Supervising second year group projects that allow students to follow a project through from the requirements gathering stage to implementation.
- 2011: **iOS and Android Development.** Working with Dr. Ian Grimstead to create an application that encourages engagement in areas (i.e. Hospitals) where members of the public can text their views and have them displayed on a large monitor. Involved an Android app to receive and forward the texts with an iPad app to receive SMS and design screens to be output by the device.