ICS PhD Portfolio
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Statement of Purpose

Background and Research Interests

There is a large explosion over Washington D.C. Do you send in the troops, the red cross, the firefighters, or the hazmat team? A rolling brownout is traveling across the country, can you predict and mitigate the effects before it hits you? A large tsunami was generated by an earthquake and is heading directly towards Hawaii, do you have enough timely information to make an informed decision on evacuation procedures?

Wouldn't it be great if we could answer these questions in a timely fashion using low-cost distributed sensor networks?

The explosion of internet connection devices (the Internet of Things IOT) has made answering these questions possible. By deploying vast distributed sensor networks, it's possible to obtain the data that answers these questions, however there is so much data that finding the signal in the noise can be like finding a needle in a haystack.

My primary research interests lie in the realm of distributed sensor networks and the software architecture that supports distributed sensor networks; namely distributed computing. More specifically, work towards my PhD involves the design and implementation of a framework that can support acquisition, persistence, reporting, and real-time analysis of temporospatial time series data for distributed power quality monitors and distributed infrasound sensors.

The recent and on-going explosion of Big Data has presented a complex challenge for data scientists and system architects. Large sensor networks continuously streaming data will often overwhelm a single server. Traditional database techniques quickly break down when Gigabytes of meta-data need to be continuously written and queried. Trying to process Big Data on a single server quickly becomes an exercise in futility.

My research interests are solving these problems in a unified and transportable way. By leveraging distributed computing, I aim to provide a framework that can meet the demands of this Big Data explosion and to advance the fields of distributed sensor networks and distributed sensor network architectures.

Goals

My short term goals are to obtain my PhD while advancing the field of computer science through building and through sharing of knowledge through publishing and attending conferences.

Once I complete my PhD I would like to remain associated with research in some way or another. Whether that's at a post-doctorate level, teaching at the college level, or working at a national laboratory.

I hope to continue my work in distributed sensor networks. Advances in these technologies can pave the way to making it easier to deploy and manage sensor networks, make it easier for smaller countries to set up National Data Centers, make it easier for universities to do large scale distributed studies and continue to advance this explosion of IoT connected devices.

Progress

Over the past three years I've been building a framework to detect transients in power quality data. I picked up a lot of my research foundation by taking masters classes in software engineering for smart grids, advanced algorithms, advanced operating systems, theory of computation, AI, and web design.

Over the past year I've been developing a framework for the collection, analysis, and reporting of temporospatial data. My funded research through the Infrasound Laboratory at the University of Hawaii at Manoa involves detecting, quantifying, and localizing large infrasonic signals by deploying a large number of distributed sensors that continuously stream data.

Through my funding agency I was able to secure a academic cooperation participant (ACP) position with Lawrence Livermore National Labs and have been working with their Big Data scientists to solve issues such as massive distributed data ingestion with type safe persistent queues. My cooperation with LLNL provides a wide-breadth of resources in distributed computing and Big Data.