
Junior Doctoral School: Unconventional Applications of Radio Frequency Identification (RFID)

Artem Dementyev
Electrical Engineering
University of Washington
Seattle, WA, USA
artemd@uw.edu

Abstract

This is a submission for the junior doctoral school. Completed research up to date, planned research and reasons for attending the doctoral school will be presented here.

Author Keywords

Doctoral School, Ph.D., learning

ACM Classification Keywords

H.5.2 [Information interfaces and presentation]:
Miscellaneous.

Introduction

Radio Frequency Identification (RFID) uses electromagnetic waves to transmit data and energy between a reader and an active or a passive tag. Traditionally RFID is used for inventory and identification applications, such as tracking items in a warehouse. In terms of energy, the communication link between the reader and the tag is asymmetrical, reader invests a lot more energy into communications than the tag. Often the tag is passive, and is powered entirely by the reader's electromagnetic field. To send the data, tag modulates the reader's electromagnetic field, a process that consumes little energy. With the improvements in the microelectronics, the computational energy has significantly decreased,

allowing the passive tags to do computing and sensing, while being powered by the reader's electromagnetic field. Such concept allows elimination of the batteries, and perpetual operation of devices such as sensor nodes. For my dissertation I want to explore novel RFID applications by using passive software defined RFID tags.

Completed Research

I was involved in two projects relating to the RFID. Both involved software programmable RFID tags called WISP (Wireless Identification and Sensing Platform), developed previously at Intel and University of Washington

First, we made an electroencephalograph (EEG), that is battery-free, and can be powered with a standard ultra-high frequency (UHF) RFID reader. The device was named EEGWISP and it is show in Figure 1. This research was published and presented at the 2013 IEEE RFID Conference in Orlando, FL.

Second, we made a RFID powered display tag. The tag can get power and data from an off-the-shelf mobile phone through near field communications (NFC). The device concept photo is shown in Figure 2. This project will be presented here at the 2013 Ubiquitous Computing Conference in Zurich, Switzerland.



Figure 1: Possible use scenario for EEGWISP



Figure 2: Display tag use scenario: companion display for mobile phone.

Planned Research

The research plan is to build on the two projects that I was involved in, and are mentioned above. For example, finding a brain-computer interfacing (BCI) applications for the EEGWISP, such as to control a certain part of helper robot operation for a paralyzed individual

Reasons for Attending the Doctoral School

By getting feedback from the researchers in the field, as well as students, I want to get a better understanding of my Ph.D. research topic. An important question I want to answer is the breadth of my topic, and if it should be narrowed. Furthermore, doctoral school will provide an opportunity to met people in the field, and learn from their experiences. Also, I want to attend doctoral school to obtain about future carrier. At the moment I am not sure what carrier path I want to take