

ENSC 440/305 – WRITTEN PROGRESS REPORT

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AirTack Industries: Real Time Air Monitoring System

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INTRODUCTION

This report details the progress of AirTack's Real Time Air Monitoring System, emphasizing developments made since the oral progress report (February 21st, 2013). During the last three months, engineers at AirTack Industries have nearly completed Phase I and II of the development cycle of the AirTack Real Time Air Monitoring System (RTAMS), a complete air quality monitoring system capable of examining natural gas, carbon monoxide, smoke(particulate), humidity and temperature levels in a home environment. Phase I and II tasks, as outlined below, involve the completion of the Proof-of-Concept prototype system.

Phase I (Sensing Functionality):

- Sensing
 - Natural gas, carbon monoxide, particulate, humidity and temperature
- Establishment of threshold levels for each sensed factor, calibration with basic feedback to ensure correct detection and comparison with threshold level.
- Integration of sensing module to server via implementation of power line communication
- USB communication between server and computer

Phase II (Response Functionality):

- SMS response once levels have surpassed programmed thresholds, specific to each factor
- Completion of basic data analysis and graphing software on computer to connect to server
- Ventilation management and buzzer proof of concept

PROGRESS/SCHEDULE:

Initially the project was set to be completed by April 1st, 2013 due to graduation timing constraints. However, the relaxation of this constraint and our presentation scheduled on April 22nd, 2013, we have spaced out our initial milestones to ensure a higher quality finished project, taking advantage of this time. Progress is on track and no remediation is necessary.

SENSOR MODULE:

The sensor module is nearing completion – data has been successfully sampled from the carbon monoxide, natural gas, humidity and temperature sensors. One component of the sensor module, the smoke/particulate optical sensor, still requires testing to ensure data can be fetched. This is due to a part failure and delay receiving a replacement, but we are confident it will operate as expected. All software for collecting data from each sensor is complete.

Communication between the sensor module and the central server to send data packets is still under development but will be completed in the next few days as the integration process wraps up.

SERVER MODULE:

The Server Module serves several functions and acts as a central node for the network. At this time, data received from the sensor module has been successfully stored in the onboard SD card and sent in packet format to a computer via serial to USB. Requests for data from the Sensor module are not yet perfected, but these difficulties will be addressed in the next few days as part of the integration process. Communication between the central server and a computer for data analysis has been successfully established. At this time, the previous design decision to stream data from the SD card has been nullified due to the ease of streaming data directly to the computer via packets. Data will still be stored on the SD card, and the user may remove the card from the system to analyze these files. The implication of this design decision is that a computer always be connected to the central server module of the system. Additionally, the GSM functionality, which sends SMS messages when an alert needs to go out, is complete on its own but still needs to be integrated with the server module.

ACTIVE MODULE:

The Active Module, which is responsible for initiating basic stimulus response behaviour including buzzer and fan operation, is complete. Data packets can be sent from the central server to the active module to turn the fan and buzzer on and off. The proof-of-concept prototype only has one active module, but in future developments there can be many active modules, one for each monitored room in the house.

DATA ANALYSIS:

The data analysis component of the RTAMS is complete. Comma separated data from the system saved locally on the computer is read in by an R script, which produces trending graphs. Long and short term trending graphs are available, as are correlation bar graphs for each sensed variable. All graphs are printed on separate pages to a PDF file, saved locally on the computer.

BUDGET:

AirTack is financially on track with the RTAMS product fully within the established budget. The RTAMS had an initial budget of \$800, which was obtained through the ESSEF Project Fund. \$300 from this initial budget remains unspent and constitutes the project emergency fund in case of component failure.

HUMAN RESOURCES

Group dynamics remain relatively healthy and we are all still working well together. Trust between group members has been established through time as each of us has followed through on project development commitments thus far. We have held and continue to hold weekly meetings, at very least, and keep in contact via email when milestones have been reached mid-week.

ACTION ITEMS:

With the project now being integrated, all that remains of the project lifecycle is the testing process.

- Integration of communication between server module and sensor module.
- Integration of GSM functionality (complete) with central server module.
- Verification of new smoke detector module
- Calibration of the analog sensors
- System level testing to demonstrate proof of concept
- Design the final presentation (it may have to be outdoors)

SUMMARY

There is still a lot of work to be done, but we are comfortable in meeting our goals well in time for the project demonstration on April 22nd, 2013.