The Development of an Embedded System for First Responders

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http://wiki.ornl.gov/sites/rams09/n_brabson/Pages/default.aspx

Background

Protection against hazardous chemicals in an emergency situation is an immediate need for first responders. Fire safety and Hazmat officials have requested that a system be constructed that automates the detection of hazardous chemicals during a fire situation. SensorNet for Fire and Emergency Responders (SNIFFER) is the solution that Oak Ridge National Laboratory has developed. The system requires that audible alarms be included once a hazardous chemical is detected, and text alerts should be displayed. This entire system is to be housed in a rugged and sturdy protective covering. The goal is to implement the desired operating systems and software on the PC-104 computer stack, and evaluate which power supply would be most useful for the system. A power supply was successfully characterized and chosen for the project. In downloading the operating systems to the computer stack, the delicate task of constructing the stack was first performed. This enabled the hardware to readily receive the desired operating system. The immediate future of this project is the possible deployment of SNIFFER into the real world for first responders. Potential benefits for first responders include being able to protect individuals during a fire from inhaling hazardous chemicals, and officials being able to push out threats to various emergency agencies.

First Responder Needs

- Ways to identify hazardous materials during an emergency
- Creative ability to enable responders to make key decisions during fire, hazard, and rescue control
- Effectively communicate relative data
- Ensure safety of firefighters and first responders who handle hazardous chemicals

Project Goals

- Identify and characterize system power supply options
- Test lifetime of battery in changing environments
- Construct PC-104s with each individual module desired

Methodology

- Compare battery weight, size, and expected lifetime
- Construct PC-104 stack by reading online technical specifications
- Test PC-104 stack to verify functionality
- Use Labview tutorials to learn how to develop simple code

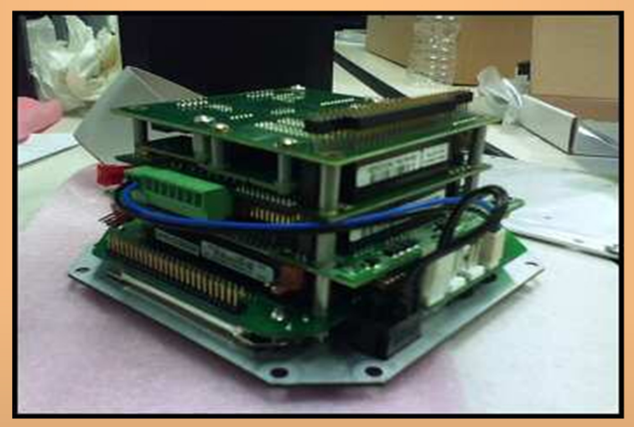

Figure 1. Athena II w/ additional modules.

Battery Type	*Power per Mass*	*Cell Voltage Nominal*	*Prices*	*Efficiency*	*Recharge Time*	*Memory Effect*
NiCad	150 W/kg	1.24	Med	70 - 90%	1 Hr	Very High
LeadAcid	180 W/kg	2.105	High	70 - 92%	Several Hrs	No
NiMH	250-1000 W/kg	1.2	Low	64%	2 - 4 Hr	Yes
Li-Ion	Up to 2800 W/kg	3.7	Med	99.80%	2 - 4 Hr	No

Figure 2. Battery comparison table.

Conclusions

- Power supplies were successfully compared
- Lithium ion battery type was chosen
- Athena II computer was assembled with additional interface cards attached for desired functions
- Both the power supply and PC-104 were included in the SNIFFER prototype
- Labview code was reviewed and learned for future use

Future Work

- Develop standard that all devices similar to SNIFFER could use to improve prototype
- Train officials on how to effectively use the device
- Continue testing and improving product in conjunction with various emergency organizations

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