Senior Design

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ECE
About

• 2014 – Ph.D., ECE, Old Dominion University, Norfolk, VA

• Teaching and Research Interests:
  – Engineering Education
  – Embedded Systems
  – Computer Architecture
  – Hardware Security
  – Low-Power Computing
Involvement at Missouri S&T

- **Classes Taught/Scheduled to Teach:**
  - Introduction to Computer Engineering (F14, SP15)
  - Digital Systems Design (FS14, FS15, FS16)
  - Principles of Computer Architecture (SP15, SP16)
  - Digital Network Design (S15, S16)
  - Senior Design I and II (F15, SP16, FS16)
Senior Design

• In the past:
  – Several faculty teaching Senior Design across different semesters
    • No guaranteed continuity
    • Different grading standards
    • Varying quality of projects
Senior Design

• Currently:
  – 1 permanent faculty + 1 other faculty
  – Common rubrics and grading standards
  – Poster presentations in Week 5
  – Push to make class more entrepreneurial
    • Presentations from Econ Dept
Building Adaptable Modular Framed Rides

**Project Description**

BAMPF Rides provides a means to build a remote controlled car that can be easily assembled by someone with little to no experience and yet provide the modifications and features that a higher end custom RC car would have without having to pay the higher dollar price. BAMPF Rides plans to make each component modular so that it may be interchanged with more advanced components, depending on the skill level of the user, with little effort for the user. This will allow for the user to continue to improve their car as their need for a higher performance or more advanced features are desired, without having to buy an entirely new car.

**Motivation**

BAMPF Rides strives to create a low cost modular remote control car that will continue to grow with the user as they continue to grow. The most common customizable car has an exterior that is customizable and has more physical space than more complete models. The car created by BAMPF Rides is designed with only the necessary parts to drive the car that customers can customize and allows for modular plug-in parts that are easily plugged into the car. This is the only way for them to customize and add features to the car.

**Value Proposition**

BAMPF Rides is a means of giving users a remote controlled car that features a customizable exterior and can be upgraded to meet the needs of any user. The remote controlled car can be upgraded and modified to meet the needs of any user.

**Progress**

The prototype of this remote control car has been completed and is awaiting testing. The team has begun working on the final design and testing of the car. The team is currently working on refining the design and testing the car to ensure it meets the needs of all users.
Senior Design

• Future:
  – Continued improvement
    • Innovation in Education grant program
      – Re-design Lab portion to include customer discovery and customer interviews
    • More faculty advisor feedback
    • More entrepreneurship
  – More company-sponsored projects
Questions?
EE 4097 Senior Design

Autonomous Sentry

Ben Blackson
Colton Pierce
Christian Moreno
Shirly Damti
Goal and Motivation

• Deterrent device for residential homes
• Surveillance AND active threat deterrent
• Inexpensive and does not require professional installation
• Real-time communication with the owner
Value Proposition

A low-cost, easy-to-set up surveillance system that provides a deterrence mechanism and always keeps you up-to-date. Covers a large area, does not require external hardware, and comes with an android application for ease of control.
System Diagram

- Wi-Fi
- GUI
- Power (Battery)
- CPU
- Micro-Controller
- Deterrent Device
- Servos
- Camera
- Power (Wall)
Project Description

- **Hardware specifications:**
  - Pan and tilt mobility of camera and mounted device
  - 120 degree or better viewing angle

- **Software specifications:**
  - Detect an intruder (blob detection or face detection)
  - Track the intruder
  - Notify the user through e-mail
  - Save images to dropbox or disk
Project Description

• GUI/Android App specifications:
  – Reboot and turn off system
  – Send commands to the system
  – Obtain images and data

• Power specifications:
  – Wall power for servos
  – Battery backup for Pi

• Active threat deterrent (optional feature)
Demo (Pictures)
Demo (Motion Detection)

Watch Motion Detection on YouTube
Demo (Face Detection)

Watch Face Detection on YouTube
Questions...
Project Description

• Goal: Infant car seat that will alert the public when a child is left in a dangerously hot vehicle

• Features:
  – Visible/audible alarm
  – Temperature and weight sensors
  – Cooling fans to reduce body temperature
Motivation and Social Impacts

• On average 38 child die each year by being left or locked in a car
• Our product will help to decrease the number
• Eventually remove the threat all together
• Inspire others to use technology to save lives
Requirements

• Alarm
  – Activated by dangerous temperature and child detection
  – Activates:
    • Siren: audible from outside of the vehicle
    • Light: visible from outside of the vehicle
    • Fans: provide airflow to help cool the child
  – Child detection: highly reliable
  – Temperature sensing: accurate and reliable

• Battery
  – Rechargeable
  – Safe, reliable

• General specifications
  – Light module
  – Inexpensive
  – Safe and child proof
Beta Prototype PCB
Beta Prototype Speaker PCB
Sensing System

- Batteries
- Control Board
- Motion Sensor
- Temp Sensors
- Pressure Sensor
- Fans
- Buckle Sensor
Remote Alarm System
Demonstration
Thank you
Save Time

Help students save time and effort

Stop Crowding

Reduce risk of overpopulating certain areas in buildings

Look Smart

Eliminate the need to search for an open spot on campus
Spot Sensor
Spot Sensor

Transmits over 150 ft.

Human body heat is only detected

120°, 240°, 360° detection radius available
Spot Sensor

Transmits over 150 ft.

120°, 240°, 360° detection radius available

Human body heat is only detected
Originally We Wanted 6 Month Battery Life

The Spot Sensor Can Last 2 Years
Manages Up To 25 Spot Sensors

Connects Via Ethernet Using TCP/IP

AC Powered
Manages Up To 25 Spot Sensors
Connects Via Ethernet Using TCP/IP
AC Powered
When the spot sensor is activated, the room color updates immediately.
The Room
Color Updates
Immediately