EEE4999 Capstone Project Feb 9, 2015
Spring 2015

PROJECT SELECTIONs (February 16-18, 2015):

The selection period will start on Monday (February 16) at 7 pm and will end on Wednesday (February 18) at 7 pm. During that time please send your top 10 projects (starting from your most favorite one) to contact-address of the course: baueee.capstone@gmail.com. Please note that assignments will be made according to the "First Come First Served" policy. Your project and your project advisor will be announced on Friday February 20th.

Remark1: If you send your selections BEFORE Monday (February 16) 7 pm, it will be ignored. You're expected to send your list DURING the selection period!

Remark2: Send your selections ONLY to this e-mail address: baueee.capstone@gmail.com! The e-mails sent to the coordinator's/advisors' personal addresses or OIS will be disregarded.

Remark3: In your selection list please specify: **Professor Name - Project Number - Project Name**

Remark4: If you don't make any selection during the selection period, we expect you to drop the course in add-drop week or you will get an NA grade.

Remark5: If you've already been assigned to a senior project you're excluded from the selections.

PROJECTS

Sarper Özharar

1. Laser Remote Listening System: Any kind of sound creates acoustic vibrations in an environment. A laser light reflected from a surface in a noisy environment carries information about this sound. Therefore, one can detect the acoustic vibrations in a room from far away and eavesdrop the conversation. This project aims to build a small prototype for a proof of-concept demonstration of obtaining the acoustic signal from a distance of several meters.

2. Optical Pulse Oximeter: The light absorption of blood, changes depending on the amount of oxygen saturated in it. By measuring the relative absorptions at 660 nm and 940 nm light, one can deduce the information about the oxygen saturation of the blood. In this project, we aim to build a portable device that will measure the oxygen level of a person's bloodstream from his fingertip. (2 students are preferred)

3. Free Space Optical Communication: The student will build a free-space optical communication system between two ports separated by a distance of 10 meters or more. It will be an analog system for transmitting audio signals.

4. Smarthome System Using Twitter: The student will build an Arduino based system that automatically tweets the pictures of any visitors that rings the bell, the temperature and humidity levels of the house, and also if there is a forced entry into the house.

5. Electro-Guitar Effect Pedal: The student will build a fully functioning guitar effect pedal with custom distortion, delay, reverb etc.

Melek Yılmaz Şengül

1. Investigation of bound-free pair production (BFPP) cross sections for RHIC and LHC energies:
It is a software work. It is based on MATLAB. In this research, the obtained numerical BFPP results will be explained with the graphs (for the differential cross sections of the produced positrons as function of the transverse momentum, longitudinal momentum, energy and rapidity) for RHIC and LHC energies. (1 or 2 students)

2. Investigation of the impact parameter dependent bound-free electron positron pair production probability for RHIC and LHC energies:
It is a software work. It is based on MATLAB. In this research, the impact parameter dependent bound-free electron-positron pair production probability will be analyzed in MATLAB for RHIC and LHC energies, and then graphical results can be discussed. (1 or 2 students)

Gökmen Altay

1. A mobile phone application software to communicate over close distance:
A mobile phone application software to communicate over close distance among any smart phones (Android and iphone) in the same room that has the application on the phone.

2. A Software application for Turkish Sentiment Analysis on Twitter data.
PIC microcontroller based device projects:

3. RF based staff locater for close distance:
A small portable transmitter will be affixed on to an important staff that may be lost (e.g. car keys). A simple receiver will show the direction to find the staff in case of missing of the staff.
Pre-requisite: Good PIC and basic RF knowledge.

4. GPS based staff locater for global distance:
A small portable GPS based transmitter will be affixed to an important staff that may be lost or stolen (e.g. car). The receiver (a smart phone or a tablet) will show the location of the staff on a map via satellite. A cheap design is aimed.
Pre-requisite: Good microcontroller and basic telecommunications knowledge. Good programming skills on mobile devices.

5. Baby monitor over a smart phone or tablet:
A device will monitor a baby (while in sleep) and send the video to a smart phone or tablet directly or over a modem.
Pre-requisite: Good microcontroller and basic telecommunications knowledge. Good programming skills on mobile devices.

6. Wireless sensitive data transmission for a biomedical device:
A biomedical device that uses wires between sensors and the device will be converted into a wireless system. Multiple students can take this project by choosing different devices.
Pre-requisite: Good microcontroller and basic telecommunications knowledge.
Pre-requisite: Good microcontroller knowledge.

Lütfi Arda

1. Electroplating project:
Electroplating is the most importing metal coating system among manufacturing processes. In this project students are expected to develop a computer based voltage/ current /time monitoring and control system including user interface that can real time monitor obtained values at personal computer and plot graphics.

2. Temperature control project:
From air conditioning to industrial manufacturing, heat and temperature control is one of the most important parameters of today's economy, production and technology. In this project

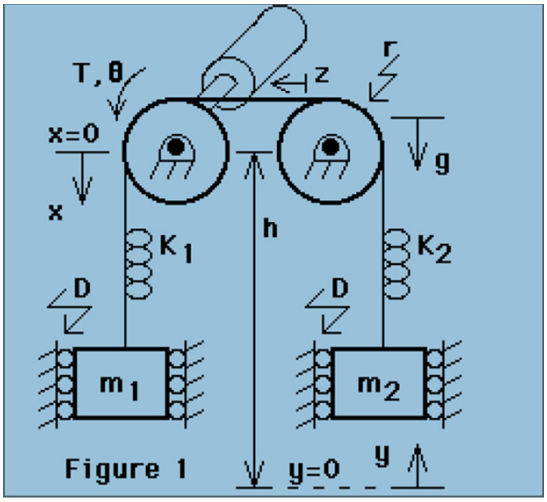
students are expected to develop an on grid temperature controller that can real time monitor device temperature in one in hundredth accuracy up to 1000 C with various types of temperature sensors like PT100, NTC, etc. and control the temperature variation precisely by dimming input power instead of switching the power on/off.

Ersin Özuğurlu

1. Modelling population:
In this project, the student should model multiple long-term partnerships and HIV transmission in a homogeneous population and solve with MATLAB. The student will gain knowledge on Volterra integro-differential equations. The student will see the improvements in the analytical and numerical treatment of the task to reduce the computation time.

2. Cardiovascular model:
A cardiovascular model (due to Ottesen, 1997) involves the arterial pressure, the venous pressure, and the heart rate. The student should investigate conditions under which the delay causes qualitative differences in the solution and, in particular, oscillations in the arterial pressure. The system will be analyzed and solved numerically by MATLAB.

3. Control systems:
Figure 1 shows the schematic for an elevator system with counter-weight. The elevator car is m1 with counterweight m2. A motor applies a torque T to one of the wheels at the top of the shaft. The student will write two equations of motion in time for the system in Figure 1, without z and q in them.
Student is also asked to write M-files to solve the task numerically in MATLAB for given specific input values.



Devrim Ünay

1. RFID based announcement system for medical centers:
Sometimes it is difficult to reach doctors in medical centers, and a common announcement system may enable getting attention of the doctor but distract others. In this capstone project, the student will design a dedicated RFID based announcement system that will broadcast message to only close-by locations where the doctor is.

2. Short-range remote monitoring system:
In this project the student will design a real-time, short-range monitoring system for human body signals. Bluetooth communication is preferred.

3. Remote Keyless System:
The student is expected to design and implement a circuitry for remotely locking and unlocking (e.g. car) doors using radio-frequency technology.

4. Wireless data recording system:
In this project, the student will design a system that will wirelessly receive data (e.g. human body signals) and record it on a PC.
5. A low-cost hearing aid:
In this project the student will design a low-cost amplifier system that will help patients with low degree of hearing impairment. The final design should be able to run on a small battery (consume less power).

6. Seam Carving (content-aware image resizing):
The student is expected to implement an algorithm in Matlab for image resizing. The algorithm will find a number of seams (paths of least importance) in an image and automatically remove seams to reduce the image size or insert seams to extend it.

Ayça Yalçın Özkumur

1. Particle tracker: The student should design and implement an image-processing algorithm that can identify bright particles with circular shapes in a given image, sort them by parameters such as size and morphology. (A user input based training algorithm may also be implemented.) The program should be able to identify the center, radius and contours of these shapes, and from a set of images, track the position of particles by determining the amount and direction of movement. (Requires use of MATLAB)

2. Oxygen saturation monitoring with a smartphone: Oxygen saturation, the ratio of oxyhemoglobin to total hemoglobin, is indicative of the concentration of oxygen in the blood. In disorders such as sleep apnea, decrease in the blood oxygen saturation levels is observed during sleep. In this project, the student is expected to design and implement a monitor interfaced with a smartphone to record the oxygen saturation overnight.

3. Laser pointer mouse: In this project, the student will design and implement a system that allows mouse clicks on a projected presentation at the location specified by a laser pointer.

4. Laser pointer drawing tool: In this project, the student will design and implement a system that can track the movement of a laser beam and projects the corresponding path on a screen. The user should be able to select the color of the "ink" and the line-thickness.

5. Solar charger for cellphones: In this project, the student will design and implement a solar cellphone charger. The final product should be light, efficient, and embedded in a cellphone cover.

Serap Aydın

1. Body temperature measurement from palm:
A small handful electronic device will be designed and produced to measure the body temperature from the palm. The measured temperature must be displayed digitally.

2. Voice controlled switch:
An electronic switch will be designed and produced to open the switch when a drop-defined sound is received by the switch.

3. Color Recognizer:
An electronic device consisting of a small camera will be designed and produced to recognize pre-defined colors and then state the recognized color in both letters and voice.

Ömer Polat

1. Design of a simple switchable window
Switchable glass, also called switchable windows, is devices that changes light transmission properties under the influence of applied voltage, light or heat. In this project, a switchable

window which changes transmitted light intensity with applied voltage will be designed using waste liquid crystal display (LCD).

2. Design of a simple polarimeter
An optically active substance (fruit juice for example) is one, which can rotate the plane of polarization of plane polarized light. Polarimeter, which is a device that can measure whether the plane of polarization has been rotated clockwise or anti-clockwise, and by how much.

Atabey Kaygun

1. Machine Learning and Natural Language Processing Methods in Analyzing Twitter
Students are expected to learn how to work with twitter API, and collect, store, clean and analyze data using variety of tools available.

2. Basic Artificial Neural Networks
Students are expected to learn to write a basic ANN for solving various problems such as recognizing and classifying images and other forms of data.

Süreyya Akyüz

1. Classification of Sleep Stages with Machine Learning Tools: Polysomnography (PSG) is a type of sleep study which contains multi-parametric tests such as brain (EEG), eye movements (EOG), muscle activity or skeletal muscle activation (EMG) and heart rhythm (ECG) during sleep at night used in the study of sleep and as a diagnostic tool in sleep medicine. It is a comprehensive recording of the bio-physiological changes that occur during sleep. There are 4 stages during the sleep; NR1, NR2, NR3 and REM. In this project, sleep stages will be classified from PSG records by using Machine Learning algorithms. The output of the project will be software that automatically classifies the PSG records, which include EEG signals, EOG, EMG and ECG data.

Prerequisites: Signal Processing, Machine Learning, Matlab
Detecting Obstructive Sleep Apnea (OSA) from Polysomnography (PSG) Test by using Machine Learning Tools

2. Polysomnography (**PSG**) is a type of sleep study which contains multi-parametric tests such as brain (EEG), eye movements (EOG), muscle activity or skeletal muscle activation (EMG) and heart rhythm (ECG) during sleep at night used in the study of sleep and as a diagnostic tool in sleep medicine. It is a comprehensive recording of the bio-physiological changes that occur during sleep. Sleep Apnea is a type of sleep disorder characterized by pauses in breathing or instances of shallow or infrequent breathing during sleep. Each pause in breathing, called an apnea, can last for several seconds to several minutes, and may occur 5 to 30 times or more in an hour. When breathing is paused, carbon dioxide builds up in the bloodstream. Chemoreceptors in the blood stream note the high carbon dioxide levels. The brain is signaled to wake the person sleeping and breathe in air. Breathing normally will restore oxygen levels and the person will fall asleep again. There are three forms of sleep apnea: central (CSA), obstructive (OSA), and complex or mixed sleep apnea (i.e., a combination of central and obstructive). In this project, OSA will be detected among patients' PSG records. The output will be software classifies OSA patients written in Matlab.
Prerequisites: Signal Processing, Machine Learning, Matlab

Maksat Ashyraliyev

1. Inferring Regulatory Networks:
Mathematical models of regulatory networks have many unknown parameters among which the most interesting are regulatory weights. The main goal of this project is to infer regulatory interactions in one simple gene network using synthetic data. All simulations should be done in C/C++.

2. Numerical Treatment of "stiff" Van der Pol Equation:
Van der Pol Equation is widely used in different applied fields of science including physical and biological applications. It is well known that depending on parameter values Van der Pol Equation may become very "stiff". The goal of this project is to compare different numerical methods for "stiff" Van der Pol Equation. Good knowledge of Matlab or C/C++ is required.

Muhammed Açıkgöz

1. Developing an interface for Superposition model Analyses:
In the frame of this Project, the students will learn some basic arguments of spin Hamiltonian as well as the explicit forms of the zero-field splitting (ZFS) parameters (ZFSPs). It is expected that the students will write an interface to compute these parameters based on an already written program.

2. Design a simple metal dedector:
The operation of metal detectors is based upon the principles of electromagnetic induction. Metal detectors contain one or more inductor coils that are used to interact with metallic elements on the ground. Based on these arguments, in this Project, the students will design a simple metal detector.

Yalçın Çekiç

1. Ultrasonic Target detection with arduino:
The goal of this project is to detect object(s) using ultrasonic sensors and show the position on computer screen. Objects will be detected the ultrasonic sensors and collected data will send to Matlab by using arduino. Matlab will process the collected data and draw the detected object distance in real time. (1 or 2 students)

Çiğdem Eroğlu Erdem

1. Vision Based Security System for Buildings
In this project you will design and implement a building security system. The person who wants to enter the building will stand in front of a camera located at the door. The system (**software**) will recognize the face of the person and the door will be opened automatically (via a **hardware** setup) only if the person is authorized to enter. This project is suitable for 1 or 2 students.

2. Vision-based Product Quality Monitoring:
In this project, the student will design a system to detect and label defective products in a production line. The camera located on the top of or beside a conveyor belt and will monitor the products. (For example, you will detect whether all the M&M sweets on a conveyor belt are round and perfect, or whether the milk bottles are full). The student can design other similar product quality control problems of his/her choice and implement them using a video camera.

3. Hand Gesture Based Remote Control:
In this project, the user will control the motion of images shown on a display using hand gestures. That is, as the user waves his/her hand in front of a display, the images will slide or will be smaller/larger depending on the design. Finger gestures will be used to paint on the screen. This project is suitable for 1 or 2 students.

4. Eye Movement Controlled Human Machine Interface for the Disabled:
In this project a camera based human machine interface will be implemented to communicate with the computer. The user (who cannot use his hands) will control the computer with eyeblinks, left, right, up, down etc. eye movements. This project is suitable for 1 or 2 students.

5. Robot That Tracks Signs:
In this project you are expected to design a low cost robot that can track a predefined sign shown to it (e.g. certain pattern drawn on a board). You will utilize a cheap camera of your choice, a microcontroller and motors to drive your robot. As the sign moves around, the robot is expected to turn and follow the sign.

6. Facial Expression Recognition System for Smart Homes:
In the near future, human-computer interaction systems will go beyond the keyboard and the mouse and will be sensitive to other human signals such as head gestures (e.g. nodding, shaking) and facial expressions (happy, angry, sad etc.). Therefore, it is very important to develop systems that automatically recognize the facial expressions of a person.

In this project, the student will design and implement an algorithm to recognize the basic facial expressions (happy, sad, surprised etc.) of a person from images and/or video. Once the emotion is recognition **software** is complete, you may design a simple **hardware** setup to control the color and/or intensity of a lighting or music system based on the recognized emotion for an intelligent home application.

E. Pınar Karabulut

1. Remote Control Robotic Locker Opener for Students with Special Needs:
Students especially in wheelchair and incapable of fully using their hands need the help of others to open and close their lockers. To provide independency to these students, a robotic locker will be designed. The locker is expected to open when the person slightly moves her/his hand (or with another simple gesture) over a sensor attached to the wheelchair and when she/he moves her/his hand again the locker must be closed. The student should be able to explain how each component function in the design.

2. The Architect (Floor Plan Drawing):
A stationary and portable device will be designed and constructed to determine the plan of a room (an empty room with vertical walls and without major blind spots). The floor plan, the floor area and the length of the walls will be transferred to a computer and the control of the device will also be possible by the computer. The student(s) should be able to explain how each component function in the design. (required 2 students)

3. Mobile Phone Jammer
Preventing cellular phones from receiving base station signals can be crucial because of their some undesired potential use (academic cheating, privacy invasion, activation of remote controlled explosives etc.). In this project a wireless jamming system for mobile phones will be designed. Basically, jammer will block cell phone operation by emitting radio waves along the same frequencies that cellular phones use. This interference prevents the communication between cell phones and base stations. The student should be able to explain how each component function in the design.

4. EMF Detector
You are expected to design and build a low frequency electromagnetic field detector. The source for this low frequency electromagnetic radiation could be transformers, hidden wirings, computer and television screens which use cathode ray tubes, compact fluorescent lamps, or some radio transmitters. The student should be able to explain how each component function in the design.

Lavdie Rada

1. A combined segmentation and registration framework in image processing
Image registration and image segmentation are challenging issues that are widely used in a range of fields such as medical imaging, pattern recognition, geophysics etc. Segmentation aims at detecting and visualizing the contours of the object/objects contained in a given image while registration consists in finding an optimal diffeomorphic transformation such that two images, called template and reference, matches in some sense that deformed template matches the reference. The aim of the project is to provide different ideas and models that combine registration and segmentation from real life images or medical MRI/ CT scan images.
The students who want to work on this project are strongly recommended to take a course on image processing (2 students needed and requires programming skills on Matlab and C++)

Sadettin Özyazıcı

1. Ultrasonic Anemometer
In this project, wind speed and direction will be measured by using four ultrasonic transducers. The system will also include a micro controller to process the data and to do calculations. The wind speed will be determined from sound wave properties. A software will be incorporated to control the system.
Number of students:1

2. Vacuum Tube AM/FM Radio
In this project, vacuum tubes will be used to design and construct of AM/FM radio. The system will be powered from the 220 V RMS line. A power supply will be designed and incorporated into the radio.
Number of students:1

3. A microcontroller based CO_2 meter
In this project, an electronic circuit will be designed and constructed to measure CO_2 in air. A microcontroller will monitor the measured value and trigger an alarm or a ventilation system. The project consists of four main parts. The first part is to select a suitable CO_2 sensor. The second part is a microcontroller. The third part is a LCD display. The last part is a relay mechanism. A software will be written to control the system.
Number of students: 1

4.Design and construction of an standalone GPS receiver
The aim of this project is to design and construct a reliable GPS system. The system will display latitude, longitude, heuro time and number of satellites on LCD display. A GPS receiver and a microcontroller which will process the GPS data will be used in the system.
Number of students:1

5.Design and Construction of Autonomous Vehicle
Autonomous vehicles and mobile applications are becoming increasingly incorporated in the military, industrial, and healthcare industries. This autonomous vehicle design implements the full potential of embedded, sensor, and modular electronic technologies.
Number of Students:1

Projects by INTEL (contact: Alkan Soysal)

1. Environmental Monitoring and Cloud Analytics
Target of this project is to experience sensor data acquisition and cloud analytics. Data from environmental sensors will be locally aggregated with Intel Edison and forwarded to Intel Cloud Analytics platform for further analysis and display.

Main components of the system are Intel Edison (with Arduino expansion kit), SparkFun Weather Shield and Intel Cloud Analytics platform. Provided by the Weather Shield are humidity, temperature, barometric pressure and light sensors. Those can be used as environmental monitoring stations installed at 3-5 different locations around the campus. Students will develop embedded edge applications for local sensor data acquisition using native code development technologies (C/C++). Collected sensor data will be forwarded to cloud through the local endpoint agent. Cloud interface will be used to display time-series gauges, charts or similar. Students may prefer to further utilize the data to create alarms or similar actions based on cloud analytics.

2. Pressure Sensor Array
In certain application, using resistive pressure sensors can be too sensitive and they go into saturation when forces over 10 N are applied. When in saturation mode, such sensors fail to provide any useful data. For such applications, using less sensitive pressure sensors can provide an answer. Alternatively, the sensitivity of the resistive pressure sensor can be intentionally decreased by applying “damping” by using a tough material atop the sensitive area. However, this method gives little control over the level of damping and makes it difficult to calibrate the

pressure sensor for the operation range of interest in certain applications. Therefore, a more effective alternative method is needed.

This project will explore alternative methods that will provide the required flexibility and measurement performance. Tests will be performed on the Intel Edison platform.

An interesting article (see Reference 1) covers an implementation that deploys an array of 8x5 barometric pressure sensors for the purpose of detecting force induced pressure. It is also mentioned that damping is achieved by means of a rubber cast that is directly applied to each sensor.

Our objective is to further explore the proposed idea by using alternative smaller sensors that will allow us to construct a sensor array that will (ideally) fit in a 133 mm^2 area. It is also important to keep the height of the sensor array within a few millimeters (although there is no fixed requirement for this)

The sensor data will need to be acquired digitally (preferably via I2C) to keep the required peripheral electronic devices to a minimum. The acquired sensor data will also need to be analyzed and added (e.g. a weighed sum) to represent the force pressure information accurately.

The ultimate objective is to integrate this sensor array within a smart splint to be used in a field trial at a hospital.

Key tasks to undertake in this project are as follows. Note that only the main tasks have been outlined here and there may be additional sub-tasks to work on.

1 – Identification of suitable pressure sensors (in terms of size, input/output, power consumption, sensitivity and applicability of damping etc.)
2 – Construction of the sensor array including the required test points for easy access during testing and measurement. (Depending on the candidate sensors, more than one such array may need to be built)
3 – Calibration of the sensor array(s) for obtaining accurate readings.
4 – Integration of the sensor array(s) with the existing Edison implementation.
5 – Documentation of all the findings and the research material.

http://biorobotics.harvard.edu/pubs/2012/journal/2012_YTenzer_BarometricSensors.pdf

3. Vectoral Pressure Tracking System
Key objective of this project is to design and develop an array of pressure sensors around the wrist area that will allow accurate detection of the hand position using Intel Edison platform. The detected hand position shall also be visualized on a smart device such as a smart phone or a tablet. Ultimately, the system needs to be integrated with a smart splint that is currently under development at Intel Open Lab, Istanbul.

In this project, the pressure data captured around the wrist will be interpreted in vector form in order to derive the position of the hand. Besides the position of the hand, the magnitude of the pressure applied in multiple points also needs to be captured and presented to the user on a smart device such as a phone or a tablet.

Due to the scope of the project, it is advisable to divide the project into two main packages:
1 – Front end development: This will deal with all technical areas up to and including the transmission of data to a smart device. Identification of the required sensor types, their locations, construction of the hardware platform, embedded code development etc. are some of the fundamental areas of work in this package. Once the concept is proven to work, Intel will support the final hardware integration into a physical splint, which is going to be used for various demos and field trials that will follow.

2 – Back end development: This work package includes the smart device user interface design, development and testing. It may also include data analytics on the cloud if this project will have

that extension. Identification of the smart device as well as the software development are also an integral part of this work package.

4. Quadcopter

Target of this project demonstrates wireless communication, PID controller design, accelerometer-gyro data handling, and driving motors with PWM. While building quadcopter using Intel Edison, these targets are achieved step by step.

Remote-controlled quadcopter will be designed. Firstly, accelerometer and gyro data is converted into yaw, pitch and roll angles. Then, coefficients of PID controllers is adjusted according to behavior of each angle. Output of PID controller is mapped to PWM input of motors. Wireless remote controller sets PID controller`s offset values.

This quadcopter has following capabilities.

- Quadcopter can be moved in each direction(x,y,z).
- Quadcopter is controlled by RF remote controller.

5. Posture Guard Smart Dress

Most of us struggle to keep an upright posture while we walk or sit. Such poor posture can lead to health problems in the medium term. In order to maintain a healthy posture, all one needs is simply a reminder to sit or stand upright on a regular basis as and when needed.

This project aims to build a posture detection and a reminder tool in the form of a smart wearable using Intel Edison. The principles mentioned in project 3 (Spring Splendor dress) will still be applicable to this dress. However, because the key objective in this project is to demonstrate the applicability of posture detection and correction, some of the rules can be bent (subject to Intel's approval) if they impede the implementation.

The posture detection can be performed using a suitable accelerometer. Two key problems in posture will be targeted in this project; leaning to one side and slouching. Therefore, the placement of the accelerometer needs to be carefully considered to achieve effective detection. If using multiple accelerometers will significantly improve the detection performance, that option is also allowed.

When the wearer's posture falls outside the acceptable limits, the dress shall notify the wearer by means of audible, haptic or visual indicators (details of which will be clarified during the project). Definition of acceptable limits will also be handled as part of the project.

One useful extension to this project will be the inclusion of a smart phone that will be able to keep logs of posture violation and rectification metrics that will allow the wearer to monitor his/her progress. This extension may or may not be included as part of the project depending on the available time.

6. Spring Splendor Smart Dress

This project has been designed to demonstrate the following key requirements of a commercially viable smart dress by integrating Intel Edison based technology into an ordinary dress:

1 – *Maintainability*: Technological dresses need to be washed and ironed just like any dress. Therefore, the embedded technology needs to be designed accordingly.

2 – *Scalability or configurability*: Technological dresses need to provide sufficient added value to appeal to the general public and to justify the premium paid for them. Therefore, the more scalable and configurable they are, the easier it becomes to achieve such targets.

3 – *Practicality*: One should not need to hire an engineer to wear a technological dress. The owner shall be able to maintain and wear such apparel without any support. Therefore, required design elements need to be thought through to meet this important criterion.

4 – *Functional relevance*: Even though technological dresses can have a significant "wow" factor that makes them desirable, adding useful functionality or feature set into them can make them desirable enough to make people put their hands in their pockets. For example, a dress with dynamic lighting will be attractive for most people. However, if the same dress is able to measure the temperature of detect the mood of the wearer that will make it more desirable.

This project is aimed at demonstrating the feasibility of making a commercial technological dress using off-the-shelf materials thereby transcending "gadget" or "gimmick" type of innovations in fashion that is widespread today.

The "Spring Splendor" dress will include flowers each of which will have an LED inside them. Intel will provide guidance on the material and the construction of those flowers. The dress itself can be bought off-the-shelf and does not have to be tailor made. The flowers will be attached to the dress through an interface that will allow them to be easily detachable. The electrical cabling and connectors will be chosen such that the wearer can easily remove the sensitive parts that can be damaged in a wash cycle. In order to achieve this, creative use of conductive materials will be needed.

The layout of the flower pattern on the dress shall be configurable based on the wearer's choice. The more pattern options the better, however this will be limited by other requirements and therefore a compromise will have to be made to hit the right balance.

Accessories such as a belt may also be added to this dress which can be designed to house the batteries and other electronic components without significantly degrading the overall aesthetics of the dress. Also, attention shall be paid to the overall weight of the dress so that various parts of it does not sag.

One important technical objective is to include at least one biometric data acquisition from the wearer and to modulate the LED lighting pattern according to that reading. For example, the intensity of the LEDs may be changing at a fixed rate when no biometric reading from the wearer is available. However, as soon as a biometric reading (such as a heart rate, blood pressure or oxygen saturation) becomes available, the LED intensity can be modulated to reflect that reading. Details of such modulation needs to be decided as part of the project.

7. Eddie Racers

This project aims at demonstrating Intel Edison's wireless communication and control capabilities in an entertaining way. In order to achieve this, a two track car racing game will be taken as an example with a few modifications.

A popular existing racing game will be modified so that no physical tracks exist. Instead of physical tracks, the route will be defined by black lines drawn on the floor. These lines will be detected by the cars during the race to make sure they follow the pre-defined route.

The cars will be controlled wirelessly (via Bluetooth 4.0 or WiFi) using Android based smart phones.

Following features will be present in the application:

- Acceleration and braking
- Sound effects (e.g. engine start, horn, basic car diagnostics etc)
- Car statistics (e.g. maximum and average speed, time of run, maximum G force experienced inside the car, total energy consumption etc)