***The Governor’s STEM Competition***

***Bishop Shanahan High School***

***Regional Competition Project Plan***

**“Code Blue”**

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**Proposal**:

Through the use of real-time GPS coordinates, Google Maps Application Program Interface (API), and temperature sensors, we hope to create a prototype that can be implemented into carts which assists authorities and social services in finding and providing shelter for homeless persons during freezing conditions, while maintaining the utmost privacy of the user. We are confident that, if implemented, our device will make homeless populations safer, their protection more efficient and ultimately prevent suffering and save lives.

**Real World Problem**:

On any day, 16,200 Pennsylvanians are known to be homeless. In Chester County, approximately 684 are homeless. During one school year, school districts around the state provide services to approximately 13,000 homeless children. Philadelphia’s poverty rate, 27%, is one of the highest in the nation, resulting in a high density homeless population. This problem extends beyond Pennsylvania and is a pressing issue across the country. One major concern with the homeless is finding shelter, especially in freezing conditions. Unfortunately, some homeless people do not go to the shelters and sleep outside in the frigid temperatures. This poses a serious risk of frostbite as well as potential death from hypothermia. We intend to solve this issue with our prototype. Every additional person we can help locate and find shelter using our device is a potential life saved.

**Background Research Information (B.R.I):**  
 From December to March, the Office of Supportive Housing (OSH) assisted by the Department of Behavioral Health (DBH) may issue a Code Blue. This alert is announced when winter conditions become harmful to the health of those outside in the cold. Typically, these conditions are freezing temperatures or wind chills less than twenty degrees Fahrenheit. The OSH may also call a Code Grey during high winds, heavy rain, or frozen precipitation when the temperature is above freezing. Both Code Blue and Grey follow the same notification procedure; the Office of Court Compliance (OCC) will alert those in charge of finding the homeless and report the locations of shelters where the homeless may stay. These places are the first and best option; however, public buildings and police stations may be made available as alternative shelters if necessary. This method ensures the homeless have the opportunity to stay indoors as long as the alert is active. Our device aims to enhance this already implemented system by making the location and assistance of homeless persons more efficient

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**Identification of a Community Need:**

1. The population of homeless in Pennsylvania often struggle in finding warm shelter during cold, winter nights
2. Police and shelter personnel have difficulty locating homeless persons during Code Blue situations.
3. Despite shelter resources across the nation, the number of the unsheltered homeless remains a severe issue

**Risks and Safety Information**:

We will communicate with Social Service personnel throughout the entirety of our project to ensure the legality and appropriateness of our device. By doing so, we will be aided by people knowledgeable of the correct precautions for working with the homeless. Obtaining a human consent form (ALCU), will protect the rights and privacy of the homeless.

**Budget Documentation ($500):** (see attached Budget sheet)

**Procedure:**

1. Create the Arduino circuit using the GPRS and temperature modules. Insert SIM card into GPRS so the module can send coordinates.
2. Program and upload the Arduino sketch to the prototype. Attach the rechargeable battery module to the device.
3. Secure prototype in encasement.
4. Install Linux, an operating system. Install Python 2.7, a scripting language that will allow our TCP server to run.
5. Install MySQL, a database language which will store our latitude and longitude coordinates.
6. Install Plone along Zope. Plone is a content management system integrated into a web interface. Import MySQL Database into Plone. Integrate Google Maps API into Zope.
7. Install ZMySQLDA, a SQL Database Adapter that Zope will use to talk to our SQL database.
8. Create web page and DTML insertion methods. Open the webpage - power the device. A marker will appear on the map indicating the device’s location.

**Experimental Testing:**

To test our prototype, we will first test the GPRS functions by having two team members walk around a local neighborhood, two members monitor the server, and one member retrieve the initial two members in a car. To test the temperature sensors, we will activate them, examine the temperature detected by the device, and compare the temperature recorded with a thermometer. Information and statistics will be gathered.

**Costs of Improvement:**

To improve the project, our main development would be a better encasement. The process of making the device potentially wearable would be explored. Wearable materials would range from $40-$50 dollars per square yard. The price of making the prototype device smaller by making a printed circuit board (PCB) would range from $50-$200 dollars. Improvements to battery capacity would be required. Finally, security would be improved with the implementation of a tamper-proof circuit that would detect a break in the electrical circuit and send locational coordinates and a warning to the server. Costs of this circuit will start at $350.

**Future Application**:

Pennsylvania, and in particular Philadelphia, is unfortunately prone to a great number of homeless living in the streets. In a wider scope, the amount of homeless across the nation is also growing. With our device, we would like to reach out to shelters across the East Coast, helping them to effectively provide homeless with tools for safety and security.

**STEM Professions** **Required for Actual Product:**

*AutoCAD Specialists* to draw final designs of the encasement

*Computer Engineers* to analyze the server functions and program the Arduino sketch

*Electrical Engineers* to design and create the security circuit for the prototype

*Material Engineers* to research encasement materials and potential wearable fabrics

*Mechanical Engineers* to design and build an effective cart.

**Business/Corporate Connection:**

Communications Test Design Inc

1334 Enterprise Dr, West Chester PA · (610) 436-5203

Safe Harbor of West Chester

20 N Matlack St, West Chester, PA 19380 · (610) 692-6550

Decade to Doorways

601 Westtown Rd., Suite 365, West Chester, PA 19380 (610) 344-6900

ConnectPoints

Rei Horst, ConnectPoints Program Director

(610) 696-1999 x142

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