

Design of "Pack Pal" System to Help Severely Mentally Ill Patients Quit Smoking

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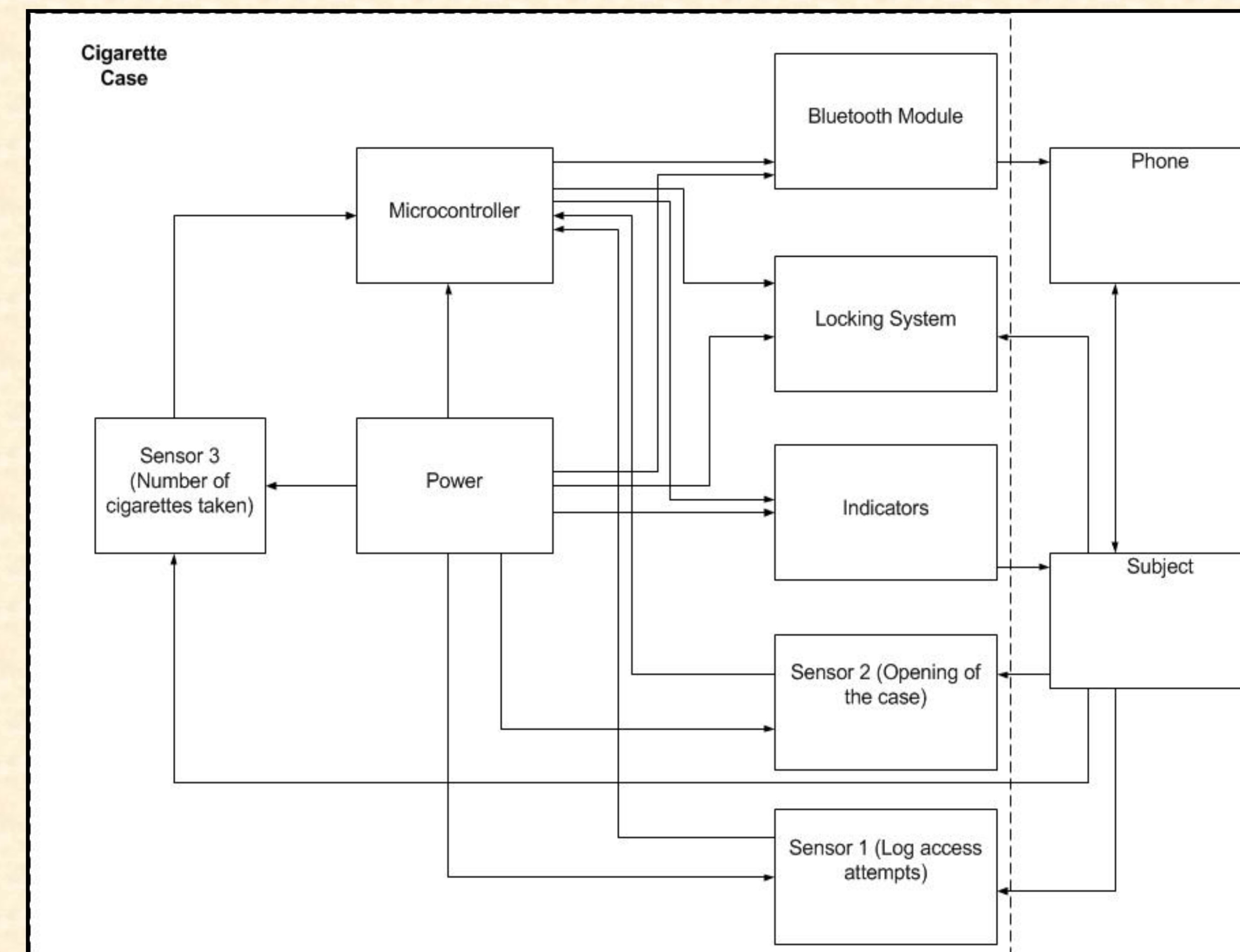


Abstract

We propose a design for a system, called the Pack Pal, to help severely mentally ill patients quit smoking. The proposed system consists of a cigarette case and a smartphone application. The case is equipped with multiple infra-red LED sensors and a linear actuator locking mechanism. A button will indicate an opening attempt and the sensors will detect the number of cigarettes removed. Upon being accessed the case interacts with the smartphone wirelessly via Bluetooth (v4.0), sending ASCII characters corresponding to sensor activation. Each time the user accesses the case, the smartphone application will take the data sent from the case and format it appropriately.

A copy of the formatted data will be reported weekly to the patients healthcare professional. Data will also be available through the smartphone application in an easily accessible and understandable manner for the users so that they can monitor their progress throughout the quitting process. Overtime, the users will gain knowledge about their smoking habits and will be able to hold themselves accountable for their cigarette use. They will practice distraction techniques (e.g., playing a video game, listening to music or engaging in another related activity), to deter them from smoking.

Block Diagram of the System



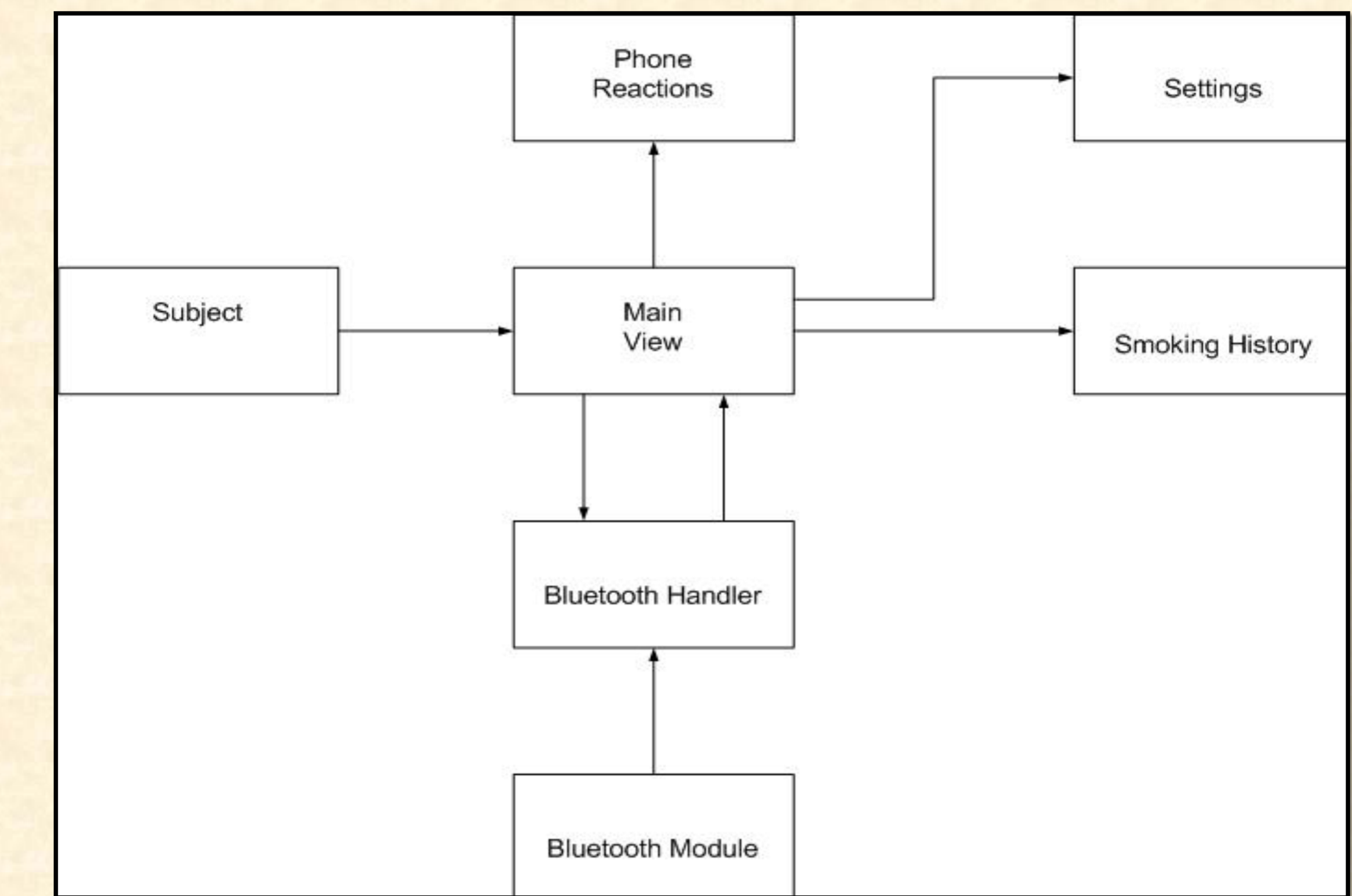
Case Requirements

- Always locked
- Open after a specified time delay
- Sense access data
 - Opening attempt
 - Actual opening
 - Number of cigarettes removed
- Transmit the data to the smartphone wirelessly

Smartphone Requirements

- Analyze the data from the case
- Deploy countermeasures
 - To discourage smoking behavior
- Picture of smoke damaged lung
- Social media
- Friends or Family
- Send weekly updates to the subject

Software Management



Background

Tobacco addiction in SMI (Severely Mentally Ill) patients

(Brunette et al., *Psychiatric Services*, 2011)

- Cigarette smoking rates in SMI patients: 45%–90%
- Cigarette smoking rates in general population: 20%

Diseases caused by smoking

- Lung and other forms of cancers
- Heart and blood vessel diseases
- Stroke
- Cataracts



Quitting smoking in SMI patients

(Brunette et al., *Health Education Research*, 2012)

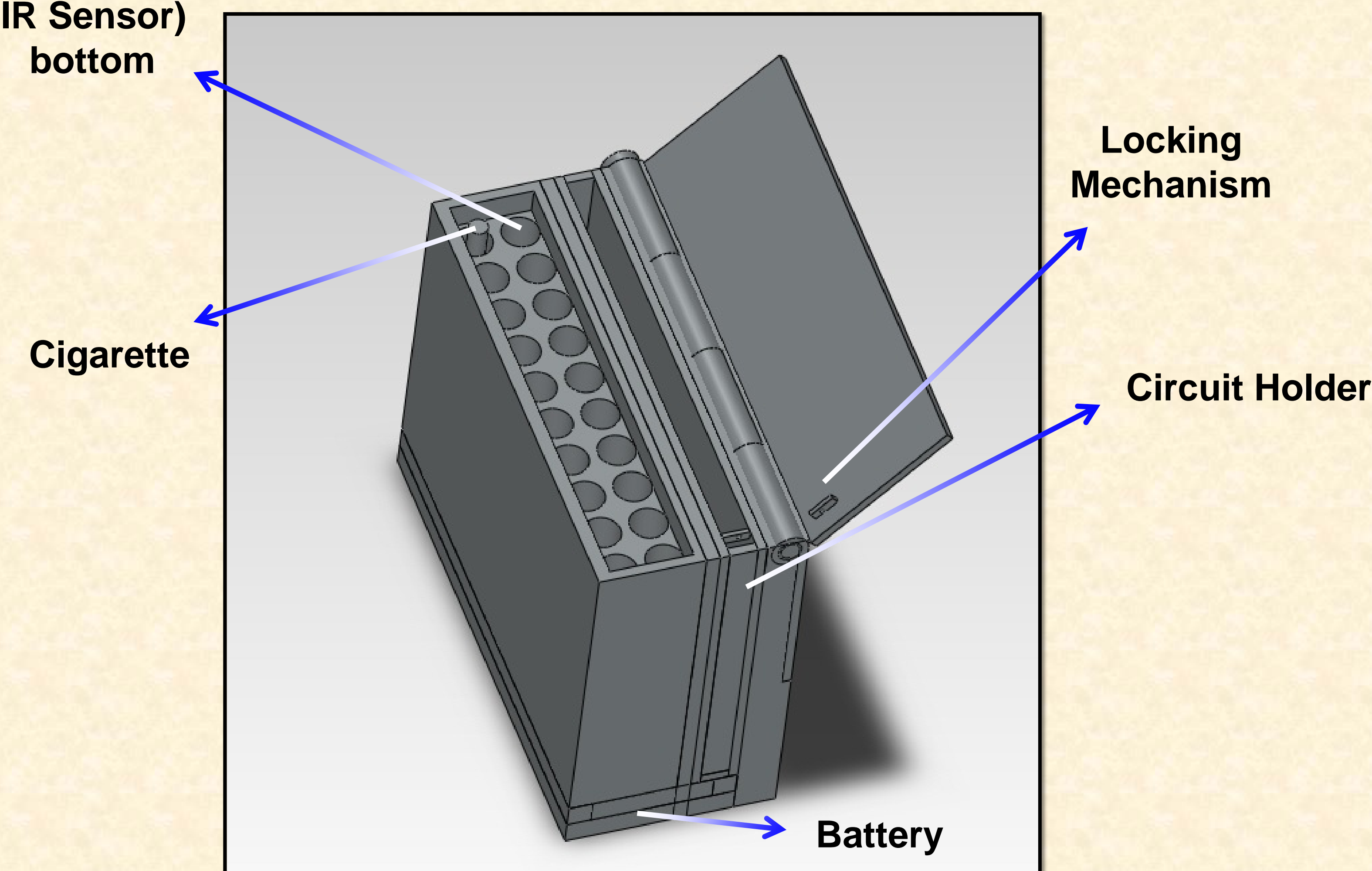
- Difficulty: Not using the traditional resources
- Solution: Using a well-designed program for the SMI
 - Constant (24 hours a day) monitoring
 - Access to structured computer programs

Motivations

- SMI patients are willing to quit smoking
- No effective therapy/program to help quit and prevent relapse
- Need for a device
 - To collect important data that helps the user quit smoking
 - To act as a coach to help the user quit smoking

Cigarette Case Design

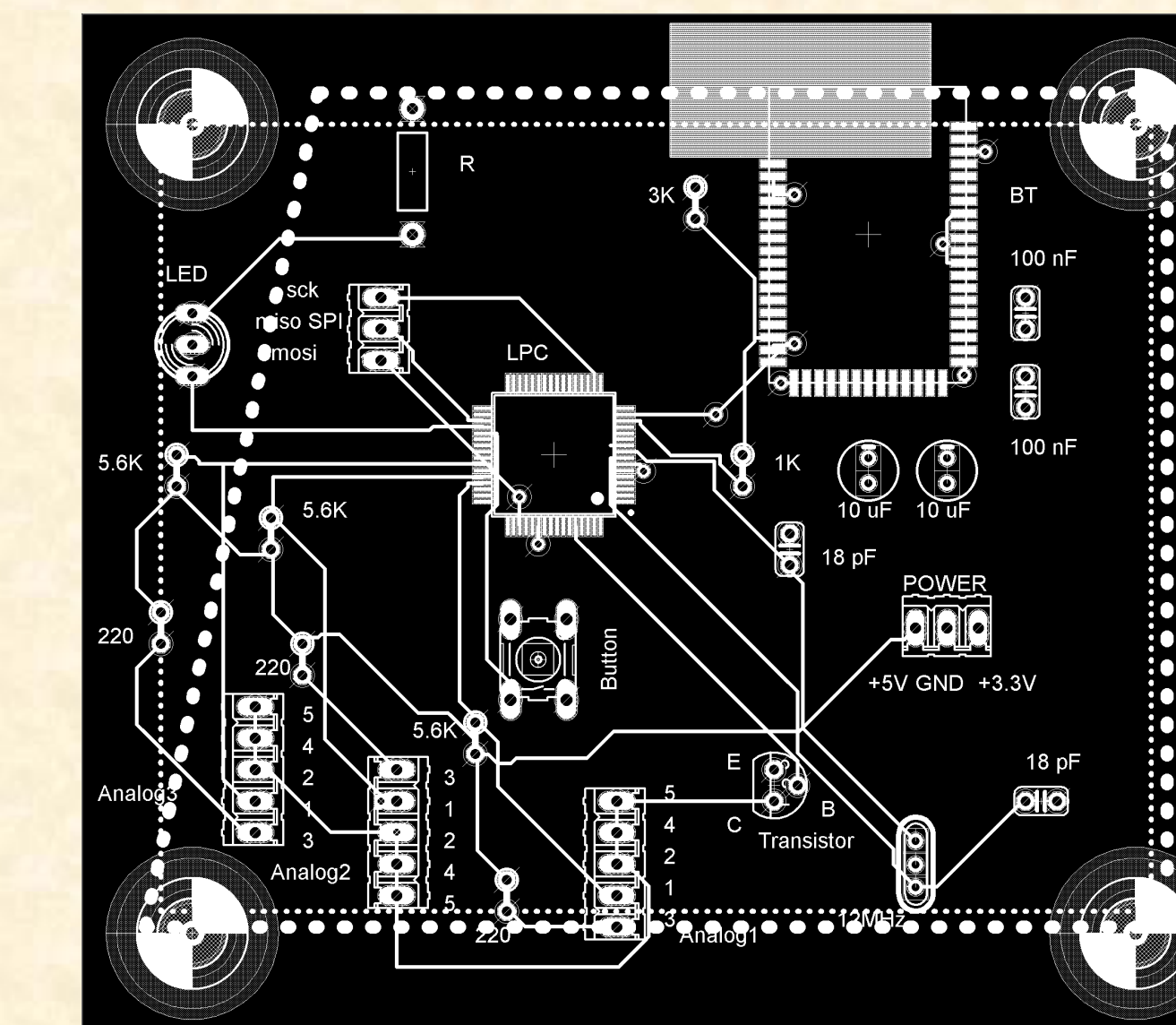
Cigarette Holder (IR Sensor) bottom



Design Features

- Integration of electronic circuitry into the cigarette case
- Logs access data and sends it to the phone wirelessly via Bluetooth
- Presents the data to the user and health professionals to aid the user in quitting
- Interacts with the user to obtain data about smoking habits
- Accessible to SMI patient base through simple text, minimal layers of navigation, minimal requirements for abstract thinking and memory
- Operates with an on-board wall-charge Li ion battery

Future Work



Application

- User interface design
- Bluetooth communication handling

Electronics

- Testing for functionality and power behavior
- Power circuit from an onboard battery
- Printed circuit board (PCB)

Fabrication

- Final prototype fabrication and system integration

References

- Brunette, M., Ferron, J., Devitt, T., Geiger, P., Martin, W., Pratt, S., Santos, M., and McHugo, G. (2011). Do smoking cessation websites meet the needs of smokers with severe mental illnesses? *Health Education Research* Vol.27 no.2 2012. Retrieved May 20, 2012.
- Brunette, M., Ferron, J., McHugo, G., Davis, K., Devitt, T., Wilkness, S., and Drake, R.. (2011). An Electronic Decision Support System to Motivate People With Severe Mental Illnesses to Quit Smoking. *Psychiatric Services*, 62(4), 360-6. Retrieved May 20, 2012, from Psychology Module. (Document ID: 2312884271).

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