

ECE4011/ECE 4012 Project Summary

Project Title	Smart Medication Adherence Phone Case
Team Members (names and majors)	<p>Kedeng Pan, CmpE</p> <hr style="border-top: 1px dashed black;"/> <p>Xiannan Di, EE</p> <hr style="border-top: 1px dashed black;"/> <p>Xingyuan Zhu, EE</p> <hr style="border-top: 1px dashed black;"/> <p>Yuhao Lin, EE</p> <hr style="border-top: 1px dashed black;"/> <p>Zhipeng Shao, EE</p>
Advisor / Section	<p>Advisor: Dr. Maysam Ghovanloo, Dr. Kevin Murnane Section: L05</p>
Semester	<p>Spring 2018 Final (ECE 4012)</p>
Project Abstract (250-300 words)	<p>The team’s goal is to design a Smart Pill Dispensing Phone Case that holds and dispenses medications under the control of an Android application. The Phone Case and Android app communicates via Bluetooth Low Energy.</p> <p>The prototype version of phone case is expected to house two kinds of medicine only (for size consideration). The case has two layer structure: the top half contains two channels that hold specific types of pills, two rotating disks that control the pill dispense, and two holders for the output pill; the bottom half contains an Adafruit nrf52 wireless board, a lithium ion battery, and two DC motors with gear sets.</p> <p>The phone application records patient’s prescription, sends notification, monitors hardware status, scans and connects to peripheral devices. The application functions are integrated to previous BP-n-ME app, where the updated version includes all previous functionality along with compatibility with smart phone case.</p> <p>The general pattern of how the phone case functions and interacts with the smartphone is described as following. After the initial configuration of entering prescription, patient receives reminder of the impending medication to be taken from the mobile app. Then, on the Android app, patient gains access to the app via fingerprint sensor built-on the smartphone. Patient confirms by tapping on the GUI of the app and a pre-set amount of pills is dispensed out of the phone case. Then the next upcoming schedule will be pushed to the front and the cycle repeats.</p> <p>Prospective benefits of the product is promising. Patients recovering from serious conditions, such as various categories of cardiovascular diseases, will less likely go through readmission and related fines on hospitals will also more likely to be significantly reduced.</p>

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List codes and standards that significantly affect your project. Briefly describe how they influenced your design.	<ul style="list-style-type: none"> - BLE: Bluetooth low energy connection enables the microcontroller to send all data to phone app. - UART: asynchronous serial communication to configure format and transmission speeds. - SPI: needed to communicate sensors with MC board. - Android studio: java package. - 3D printing: CAD standard.
List at least two significant realistic design constraints that applied to your project. Briefly describe how they affected your design.	<ul style="list-style-type: none"> - Cost: Must be low enough for mass production and distribute to vast majority of patients. Thus the number of sensors should be minimized. - User-friendly: the user-end interface should be as simple as possible. - Size: Small enough to be mounted with common smart phone and convenient for carrying. The storage amount for pills may be limited. - Reliability: The case is a portable device, therefore must be durable for daily usage, including small collisions.
Briefly explain two significant trade-offs considered in your design, including options considered and the solution chosen.	<ul style="list-style-type: none"> - Size of the dispenser: the dispenser has the same size as a usual phone case and therefore the amount of medication it carries is less. Besides, only one kind of medication is available at one time. While other dispensers with a larger size is capable of carrying multiple kinds of medication at the same time. - Android vs iOS platform: iPhones are widely used but our developers only have the experience programming in the Android environment. Therefore Android platform is used.
<p>Briefly describe the computing aspects of your projects, specifically identifying hardware-software tradeoffs, interfaces, and/or interactions.</p> <p><i>Complete if applicable; required if team includes CmpE majors.</i></p>	<ul style="list-style-type: none"> - The team is designing a mobile apps (Android) for controlling the pill tray and logging the medication activities. - Develop via Android Studio - Inputs are <ul style="list-style-type: none"> - Each medication input manually. - Appointment schedules and Doctor Information. - Outputs are <ul style="list-style-type: none"> - Push notification reminder when it is time to take which medicine - LED lights on pill tray to notify user - Including specific shape and color of the pill, and the amount - Unlock the pill tray after the notification, enabling user to take pills - Database containing the medication log for all users - Hardware-Software Trade Off <ul style="list-style-type: none"> - The pill tray can include the measurement of the amount of pills remaining - Or software needs user to log every time the pills take each time