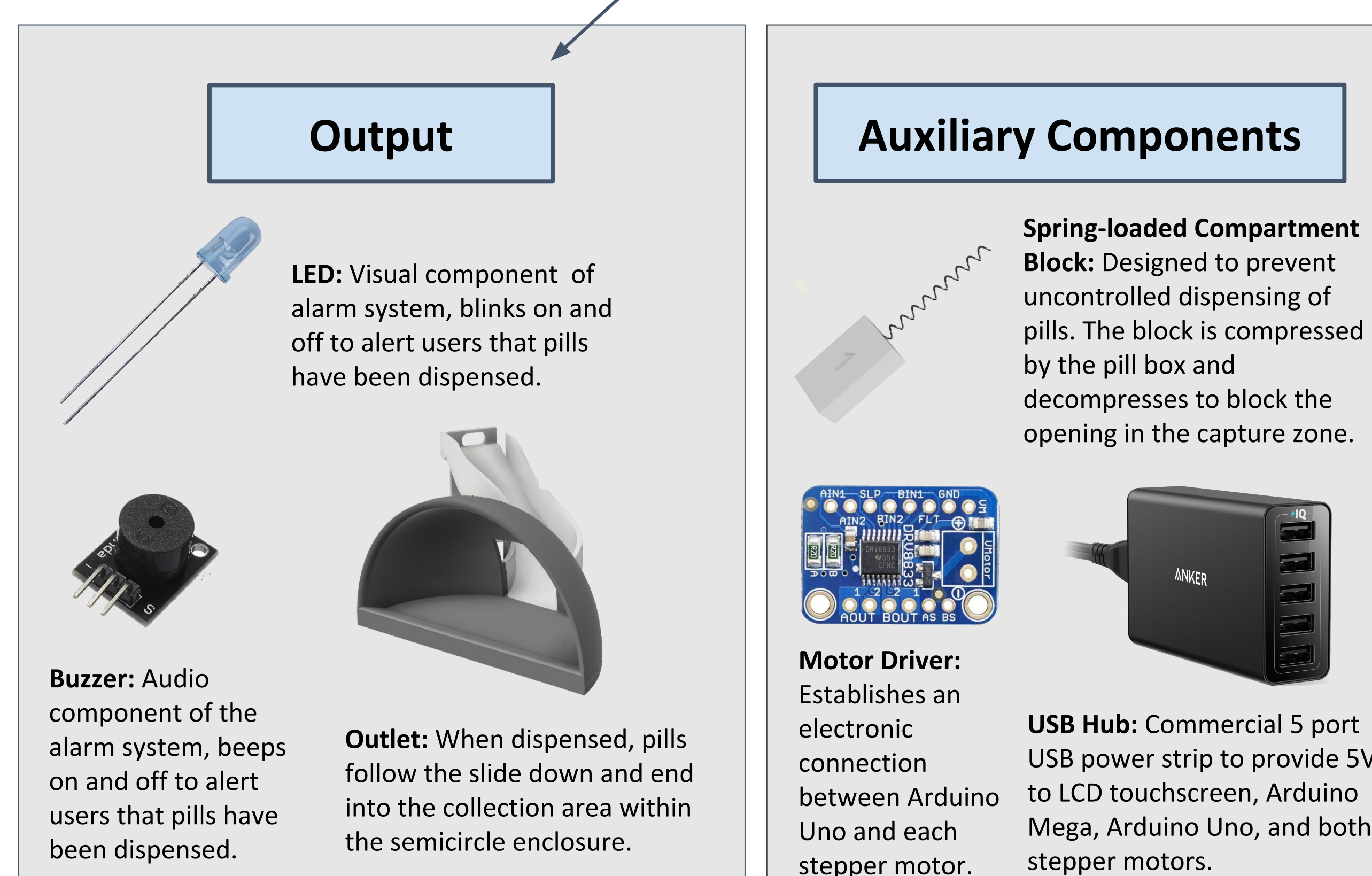
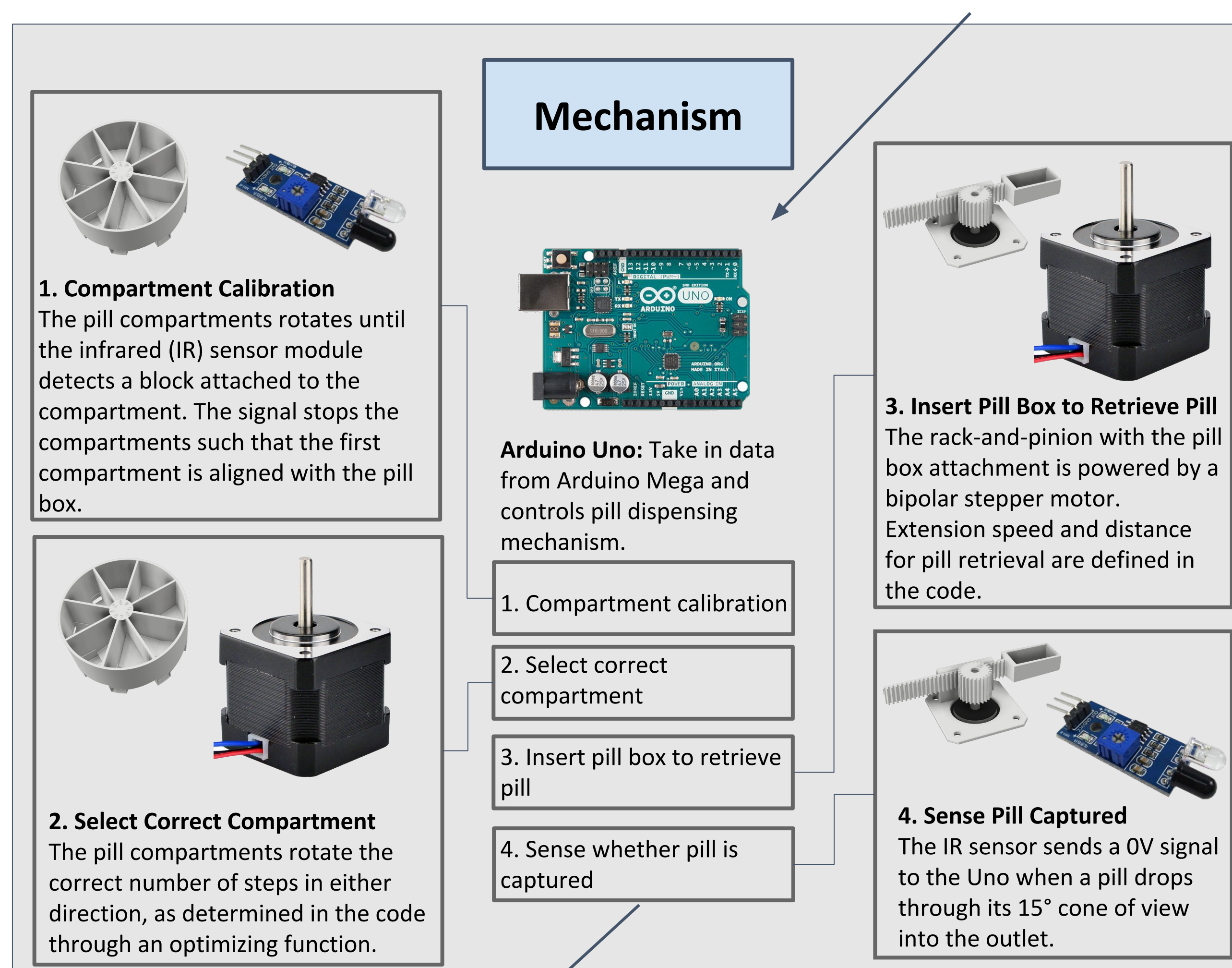
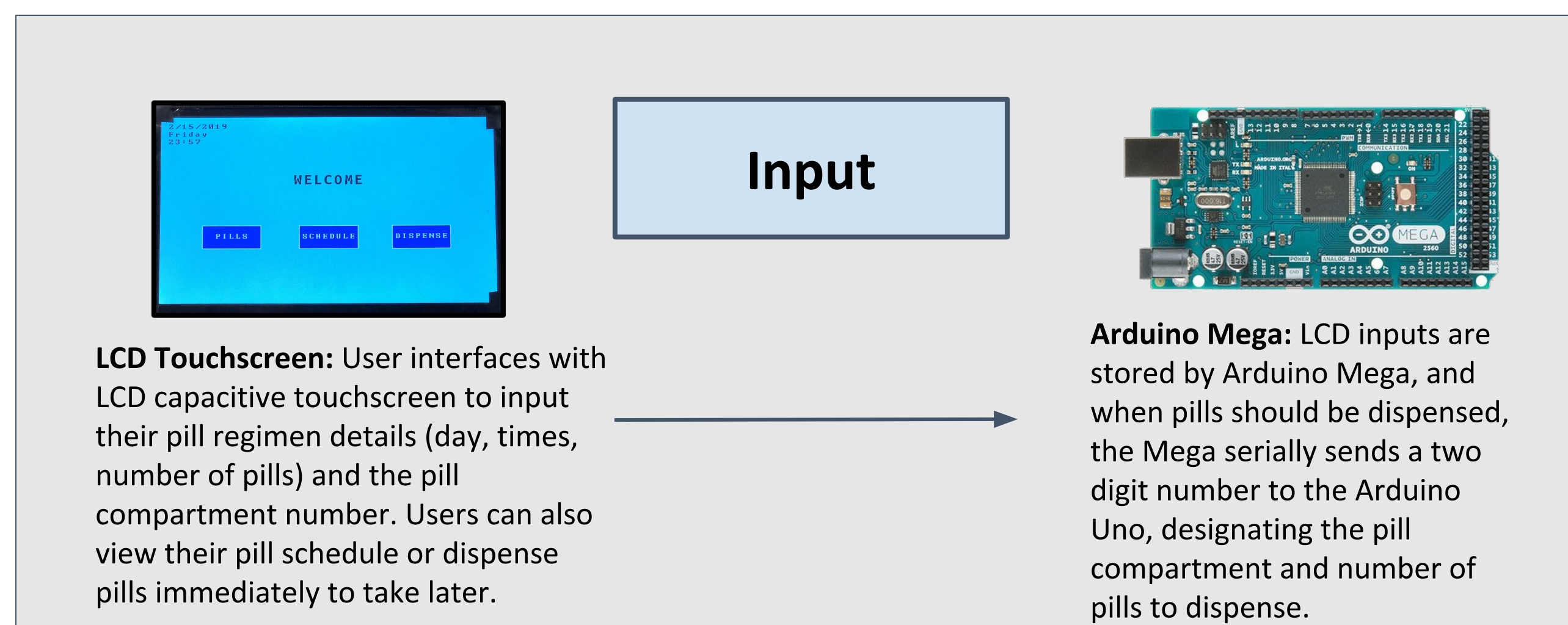


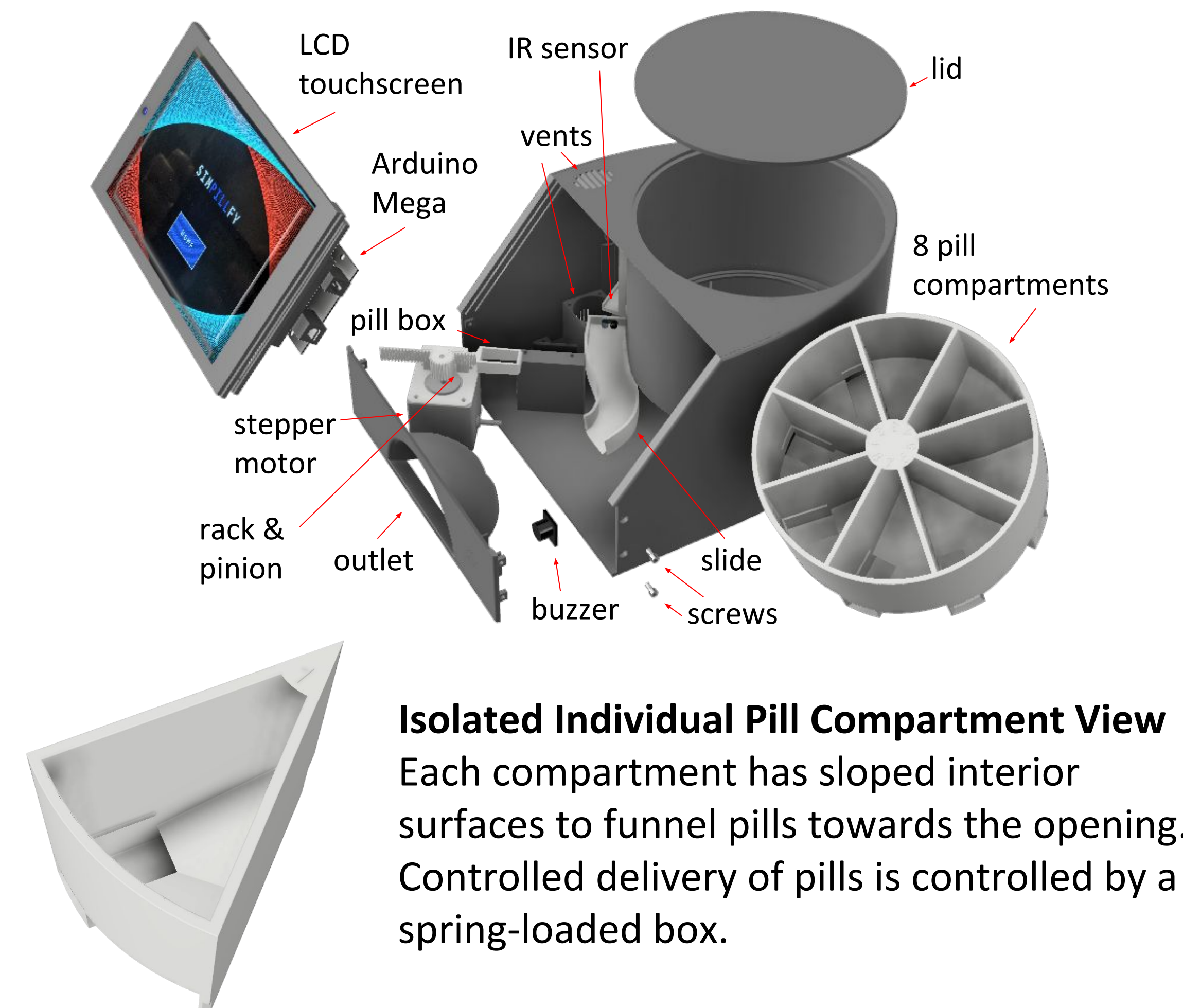
Motivation

Often times, an overlooked aspect of treating an illness occurs on the patient end in medication management. About 1 in 3 medication non-adherence cases are caused by forgetfulness, and the monetary effect of non-adherence reaches \$100 billion per year in the US alone (Stawarz 2014). The term “stressed adherence” refers to emotional pressure resulting from the perceived danger of forgetting to take medication, and patients in one study have reported the difficulties in dealing with this pressure and lack of guidance or help from healthcare professionals (Haslbeck 2009). In order to address this issue, we have developed an automated device to match the individual’s medication regimen and eliminate medication non-adherence through a built-in notification system.

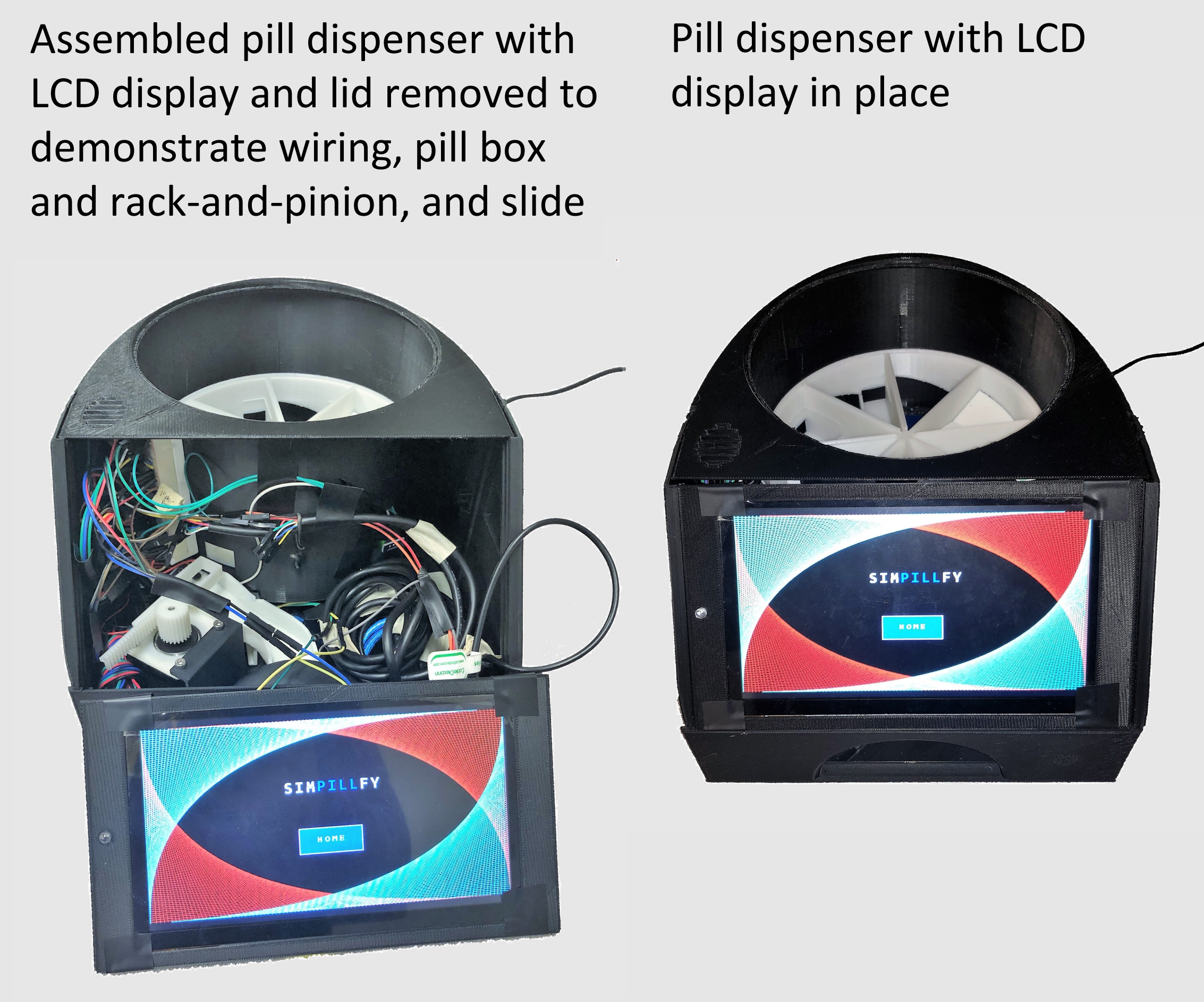
Design



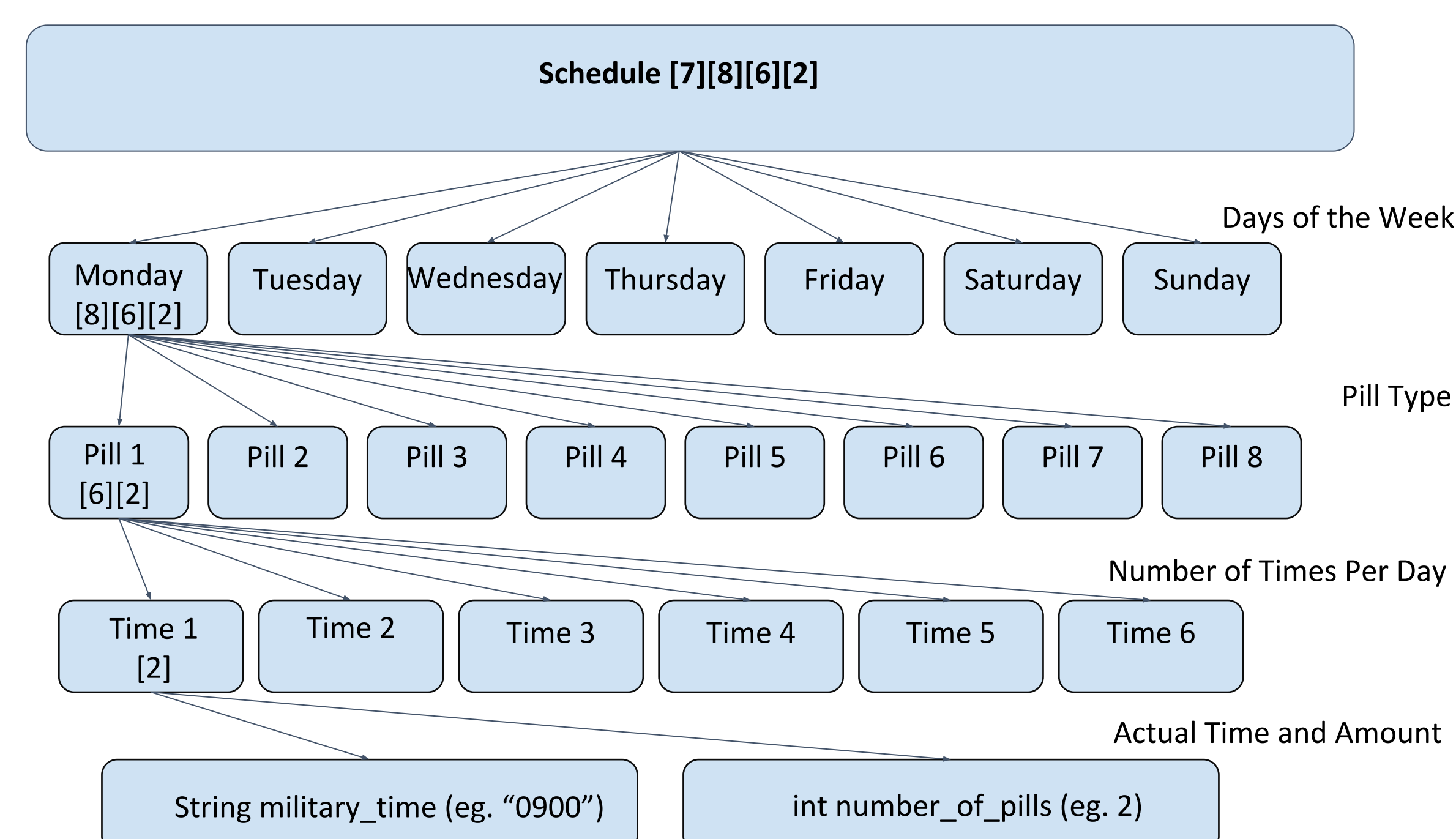
Exploded view of computer aided design (CAD) model



Final Product



LCD/Arduino Mega Pill Schedule



This chart shows the format of the pill schedule coded within the LCD/Mega unit. User inputted times and numbers of pills are stored in this 4D array. For daily usage, this large array is accessed to make a simple schedule for the current day, which can be altered if need be to dispense early - in case one will not be near the machine at the expected time. The LCD inputs all of the data from the user’s interactions with the touchscreen graphical user interface. The Mega stores this information and takes care of all time-related duties, delegating hardware control to the Uno at the appropriate times.

Obstacles

Issue	Solution
Pill box and pill compartment opening would often become misaligned during and after dispensing	Incorporate IR sensor to sense a block attached to bottom of pill compartments, allowing location calibration
Despite the pill compartment’s overall slope towards the capture zone, sometimes pills would not fall into the capture box	Implement function in code to quickly rotate pill compartments back and forth prior to dispensing to shake pills into capture zone
Even with pill compartment shaking before dispensing, sometimes pills would not fall into capture box	Incorporate IR sensor in pill slide to sense when a pill is successfully dispensed. Repeat dispensing if no pill is dispensed
Motor driver H-bridge quickly heated and became too hot to touch	Affix aluminium heat sinks and add fan with inlet and outlet vents

Future Directions

Bluetooth App

We plan to implement a bluetooth-based phone application as an added feature in the notification system. Because smartphone usage is becoming increasingly more common and widespread, including this functionality should help to further reduce medication non-adherence due to forgetfulness.

Patient Feedback System

One feature to improve healthcare by providing doctors with more information would be a system where patients are prompted for comments such as any noticeable side effects or irregularities associated with the medication. This feedback would be relayed back to healthcare professionals so that there can be a more direct line of patient-provider communication.

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- Stawarz K, Cox A, Blandford A, Don’t Forget Your Pill! Designing Effective Medication Reminder Apps That Supports Users’ Daily Routines. *CHI 2014*, pg 2269 - 2278.
- Haslbeck J, Schaeffer D, Routines in Medical Management: the Perspective of People with Chronic Conditions. *Chronic Illness*, vol 5, pg 184 - 196.

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