

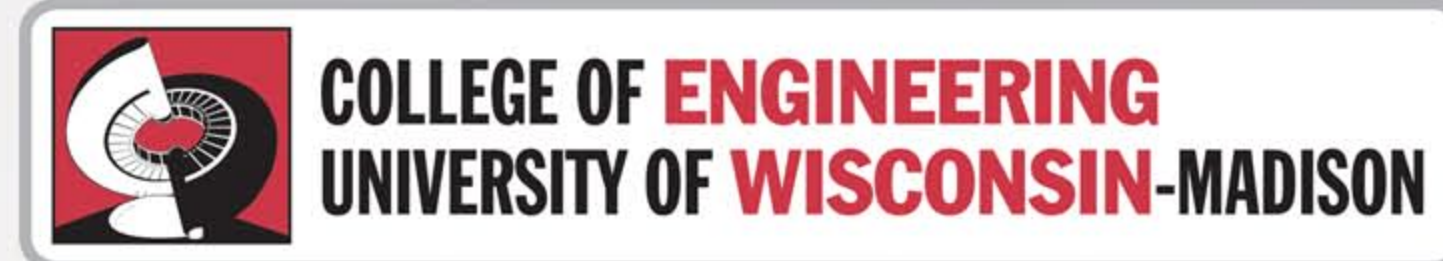
Accessible Incontinence Device

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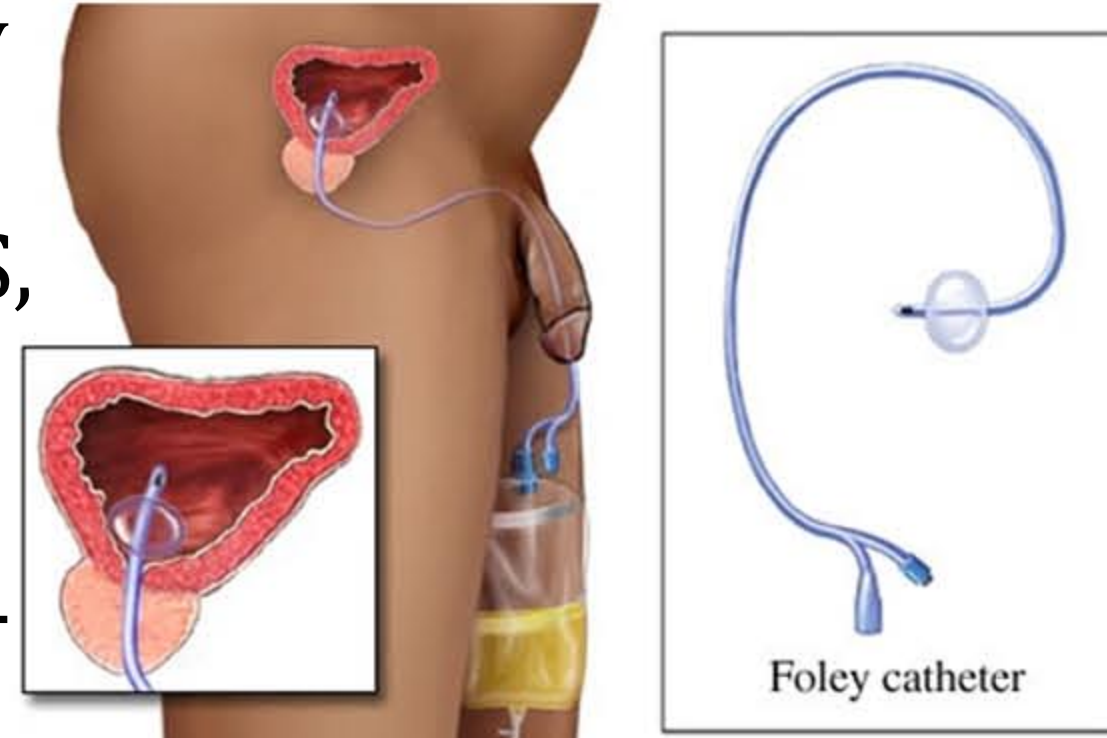
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Background & Motivation

- Urinary incontinence is the inability to control the bladder
- Affects >10 million people in the US, especially the elderly and disabled
- \$36 billion industry annually
- Foley catheters, attached to a collection bag, are often used to address incontinence but they dramatically decrease quality of life



Foley catheters are inserted through the urethra and anchored in the bladder with an inflatable balloon (eMedicine.com, 2007).

Problem Statement

The aim of this project is to design a device to allow an incontinent patient (or their caregiver) to control urine flow. The device should:

- 1) Be easily used by a patient with disabilities
- 2) Allow emptying of the bladder when desired
- 3) Prevent urine flow when not desired
- 4) Provide an indication of the status of the bladder
- 5) Remain indwelling for up to 30 days without adverse tissue reaction or material degradation

Existing Technologies

There are several commercial solutions available to monitor the status of the bladder and control urinary function:

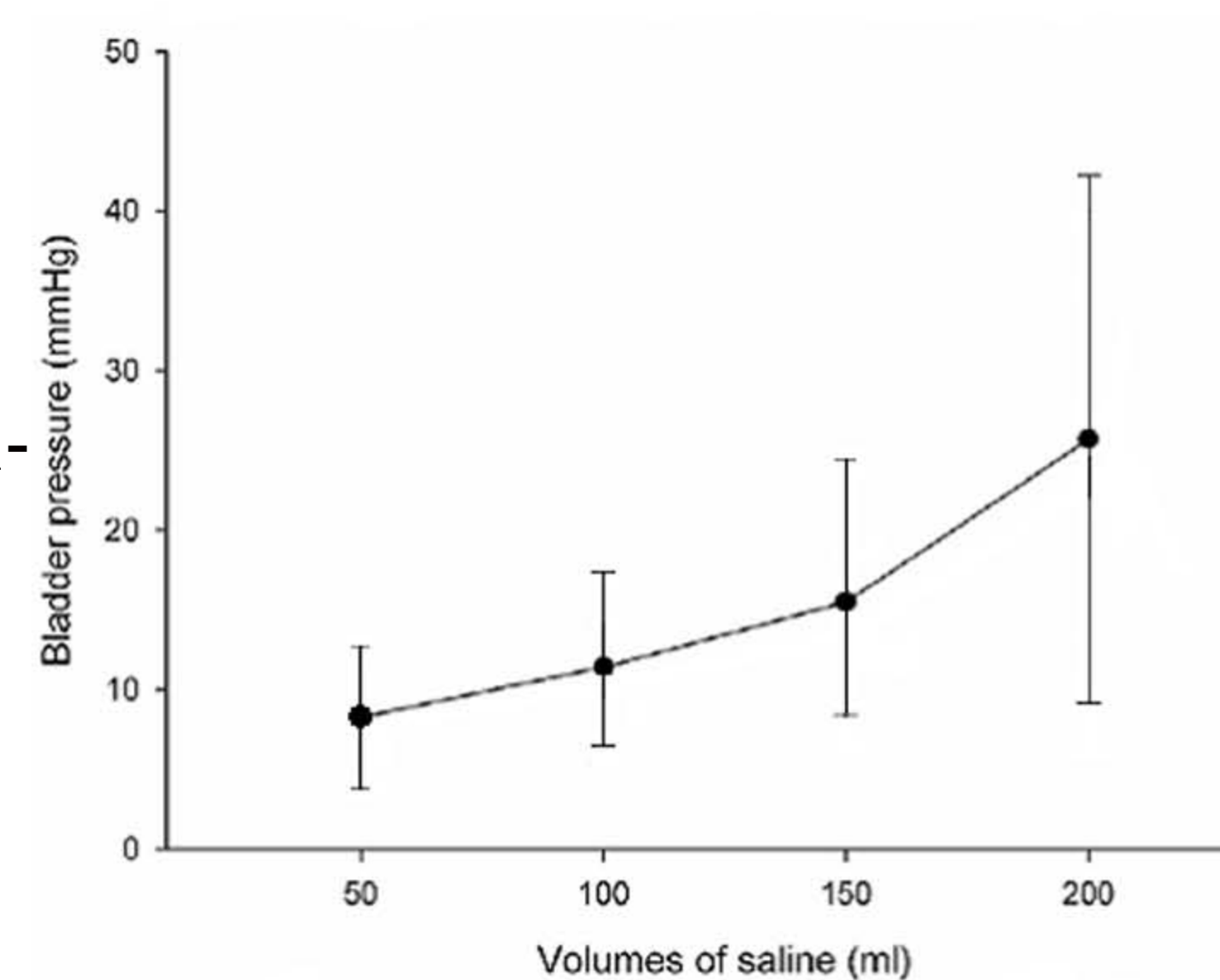
- Foley catheter with collection bag
 - Decreased quality of life
- Medtronic Interstim Therapy
 - Requires surgery
- AMS 800 Artificial Urinary Sphincter
 - Requires surgery
- Ultrasound for bladder-monitoring
 - Cannot monitor real-time with active patient



Medtronic Interstim (Medtronic.com, 2007)

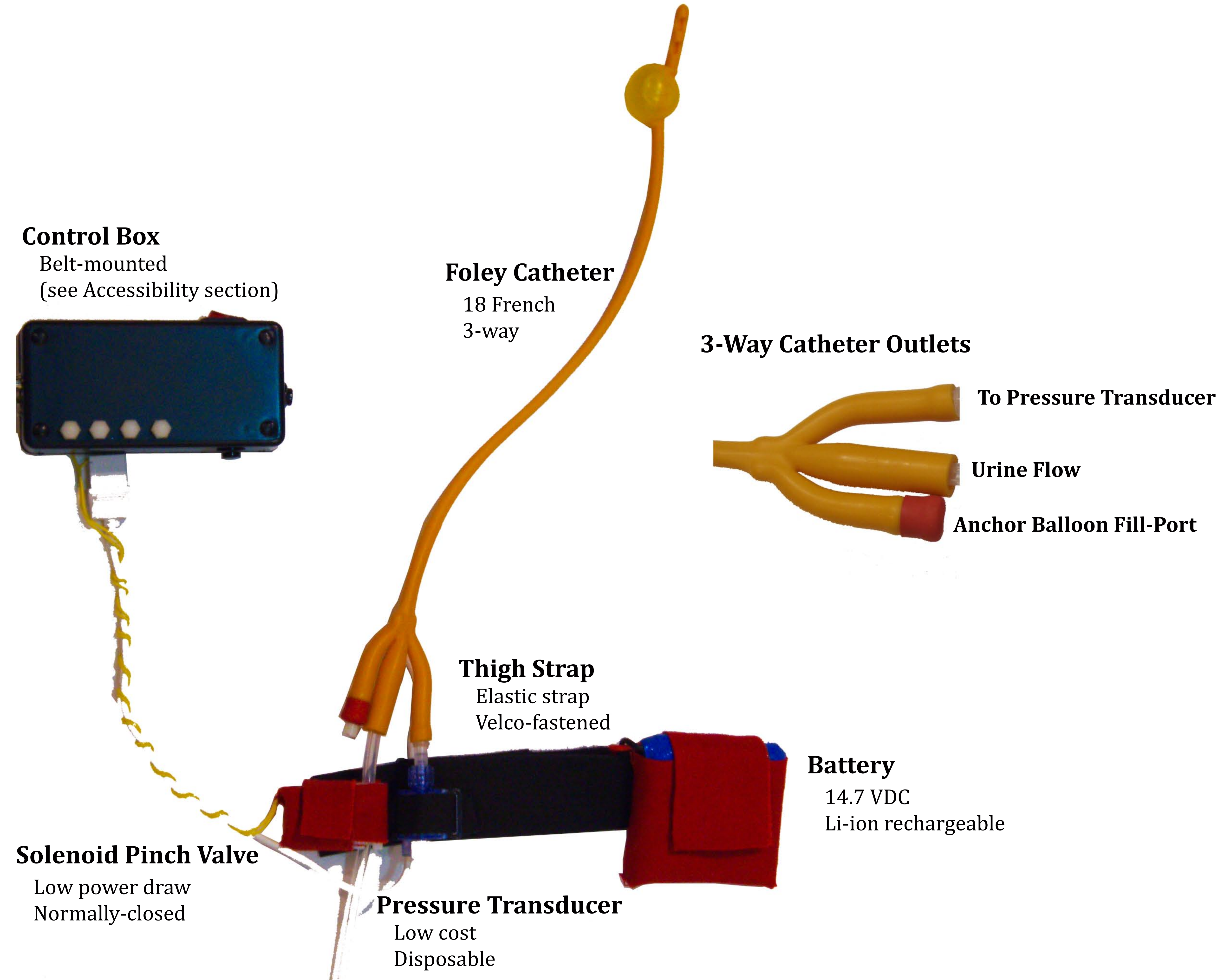
Bladder Pressure Monitoring

- Direct relationship between bladder volume and pressure
- Calibrated per patient using cystometry as bladder compliance varies
- Measured with disposable pressure transducer

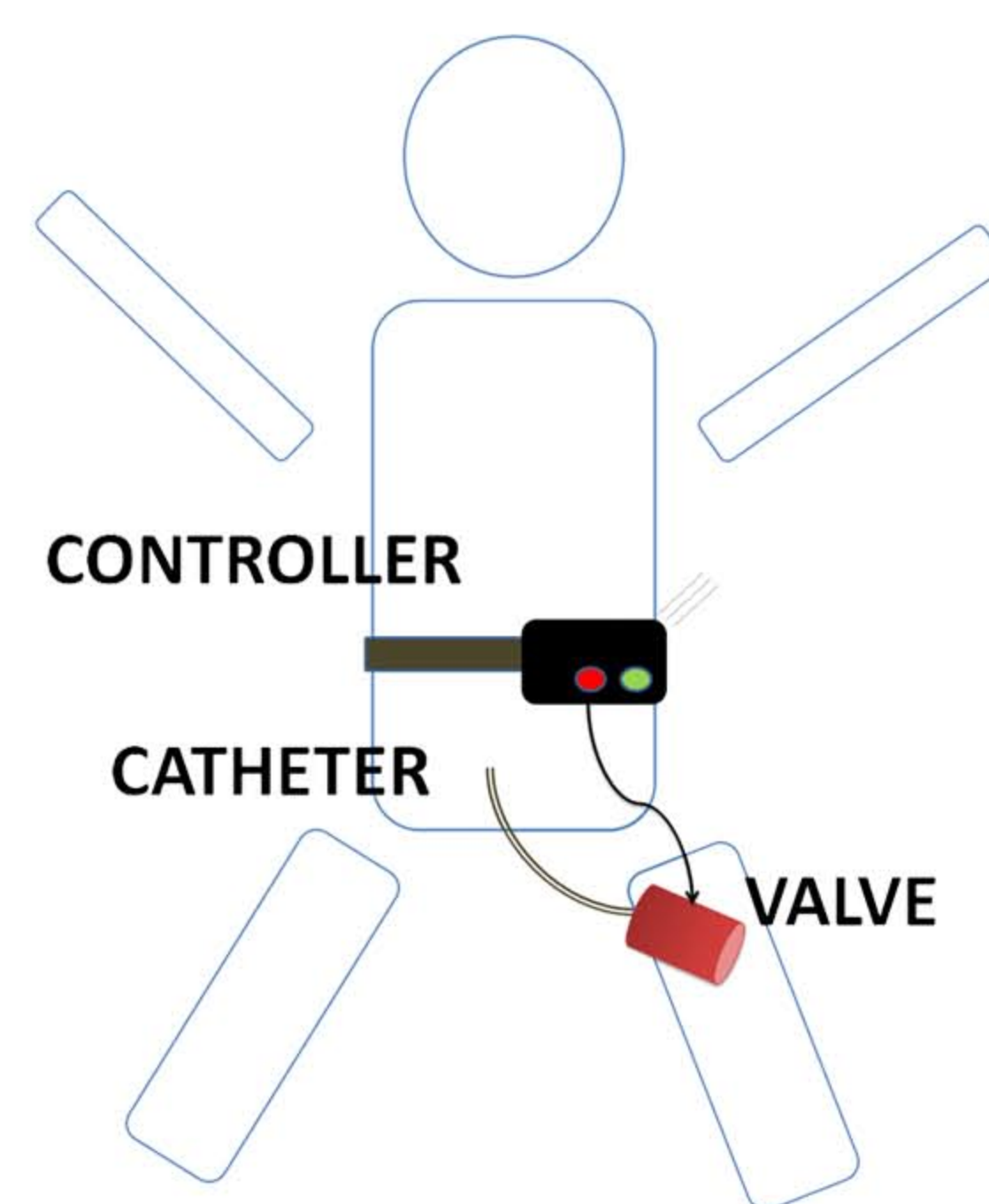


The intra-bladder pressure measured at different volumes of injected saline, according to Chiumento, et. al. (2007). The error bars represent the variance between different subjects.

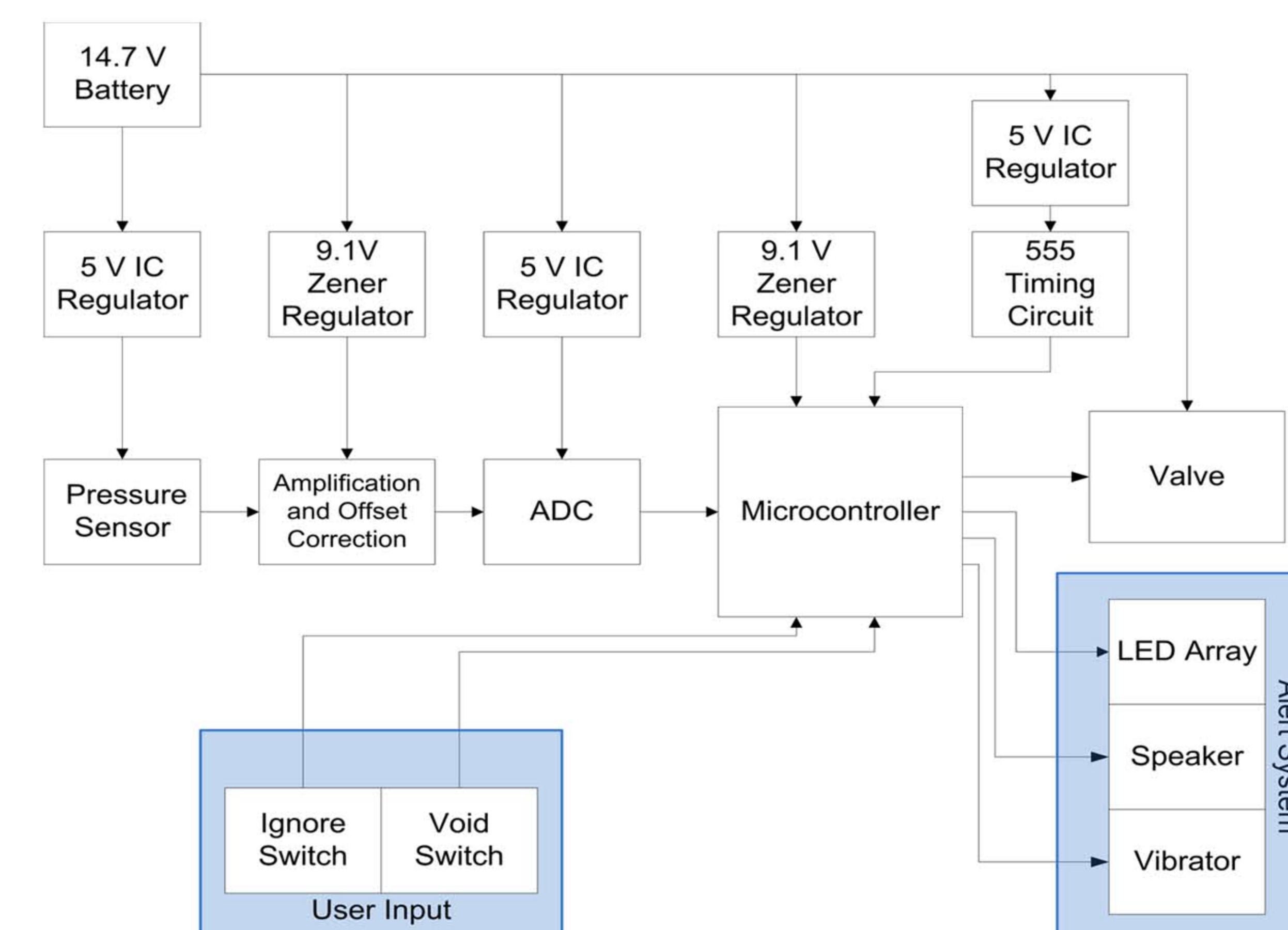
Design Overview



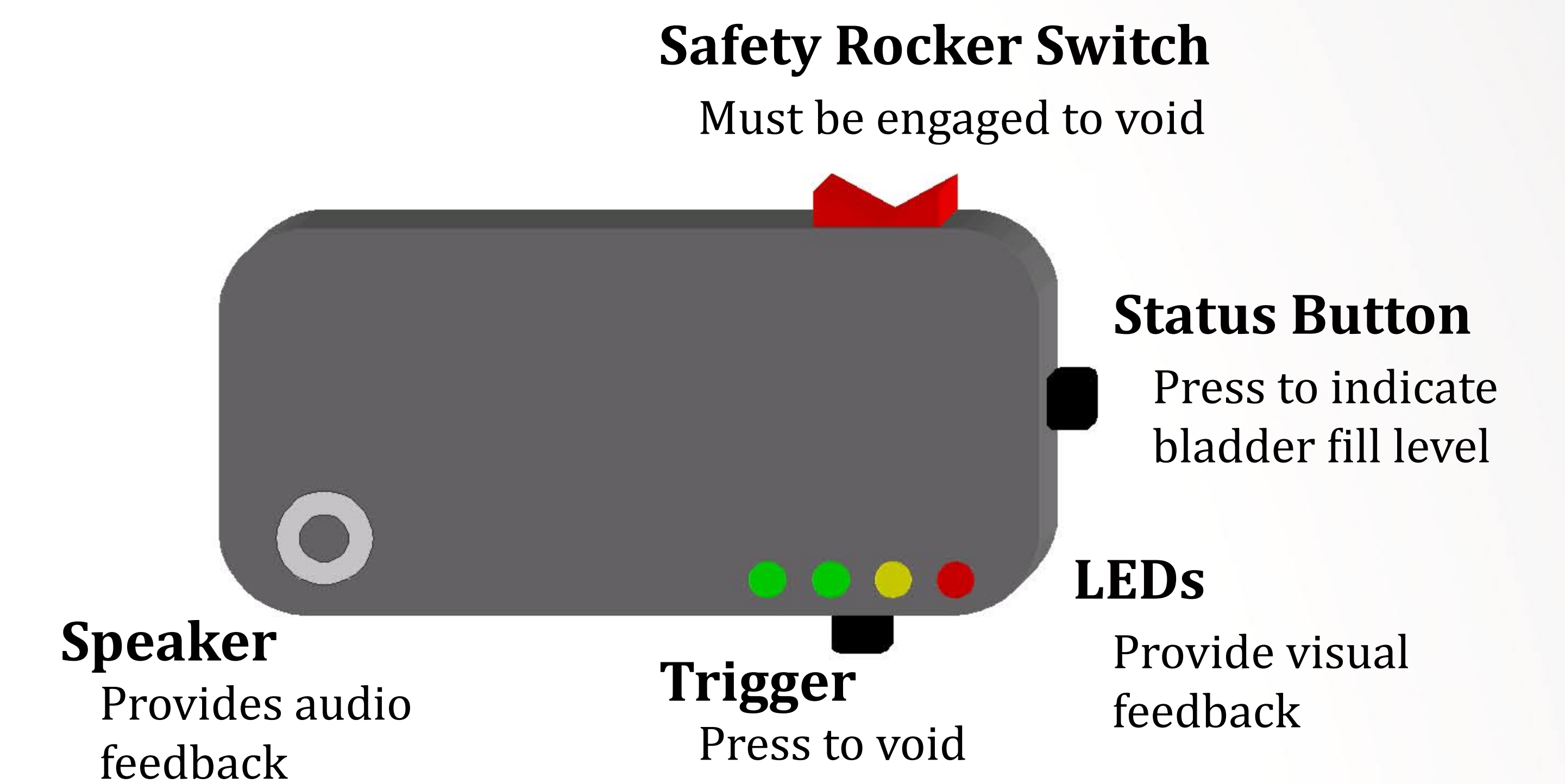
Patient Design Layout



Control Circuit Schematic



Accessibility



- Internal vibration motor provides tactile feedback
- Auxiliary port to allow for future expandability using other trigger switches for better patient customization
- Allows patients with tremors to use "power grip" for hand stability
- Designed to fit the 5th percentile of adult female hand size and larger

Conclusions

We have designed an accessible device to allow incontinent patients to better control their urinary function. This control grants them greater mobility and improved quality of life. Our design is focused on a 3-way Foley catheter. A thigh-mounted pinch valve and pressure transducer are used to control and monitor the bladder, respectively. A belt-mounted control circuit give the patient auditory, visual, and tactile feedback with an accessible interface. This project, sponsored by the RERC on AMI, will continue next semester.

Future Work

- Submit research protocol to IRB
- Clinically validate design
- More compact battery
- Implement auxiliary trigger switch port
- Purchase new microcontroller with more memory and pins
- Explore other options for tactile feedback
- Install higher resolution LED fill indicator

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