

PIRM - Dec21-18: Interactive, Batteryless Handheld Game

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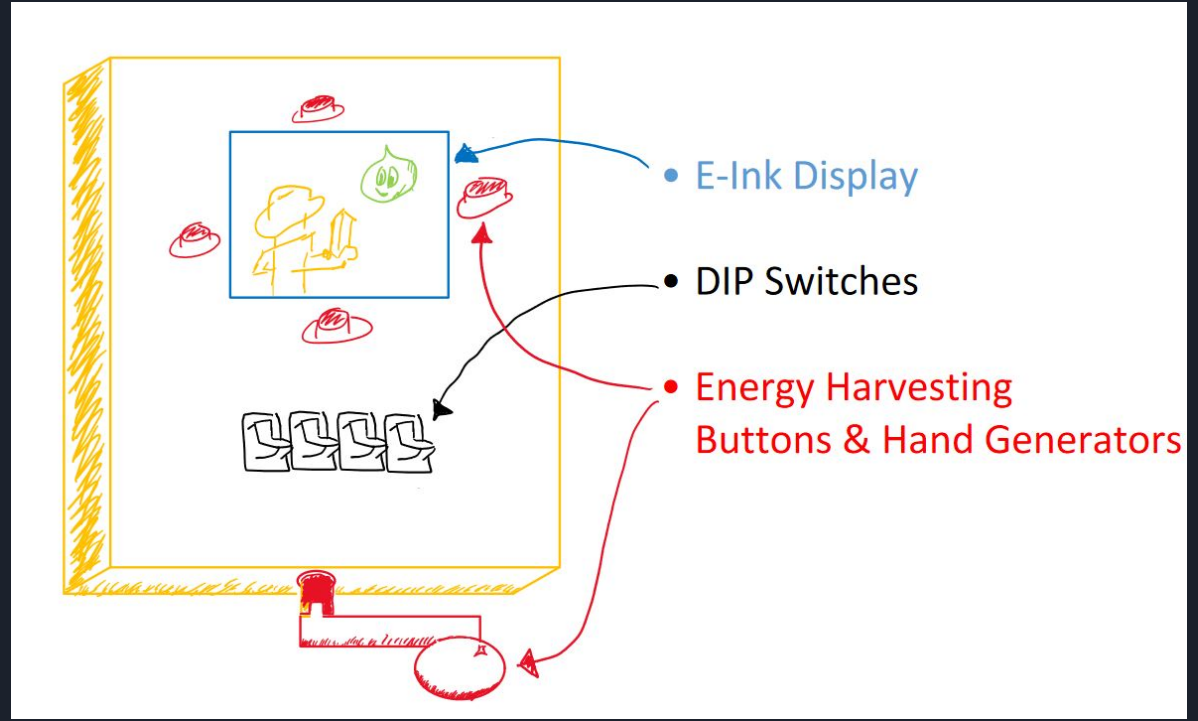


Background

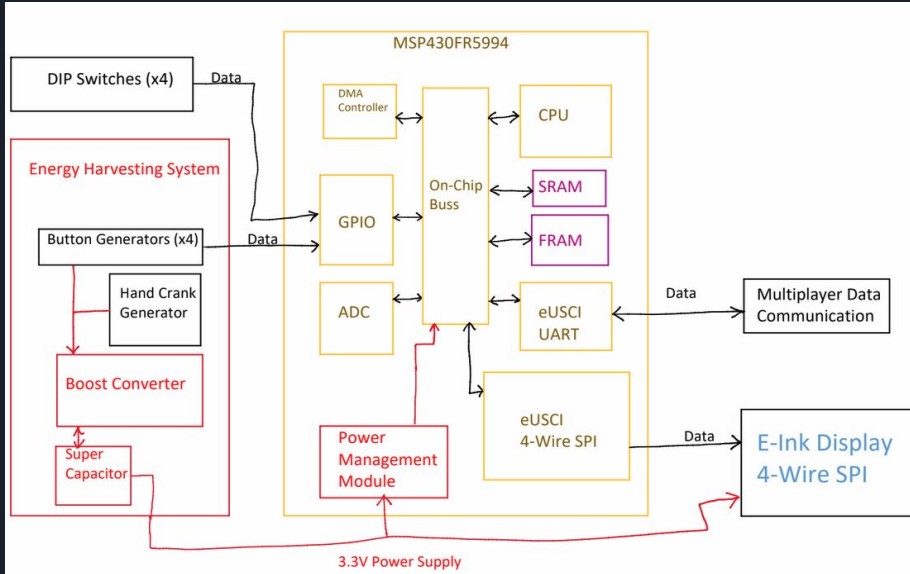
- Handheld batteryless gaming device
- Device powered through human interaction
- Game incorporates power harvesting
- No need to have charging accessories/batteries
- Dungeon Crawler style gameplay
- Multiplayer capabilities

Conceptual

- E-ink Display - low power
- DIP Switches - decision making
- Energy Harvesting Devices - power




Functional Diagram



E-ink SPI Setup





Project Goals - Fall Semester

Hardware:

- Successfully harvest energy and store in supercapacitor
- Successfully power system off of supercapacitor
- Successfully power system solely off of human interaction

Software:

- Have software and hardware integrated
- Have multiplayer working
- Successfully go through a main gameplay loop

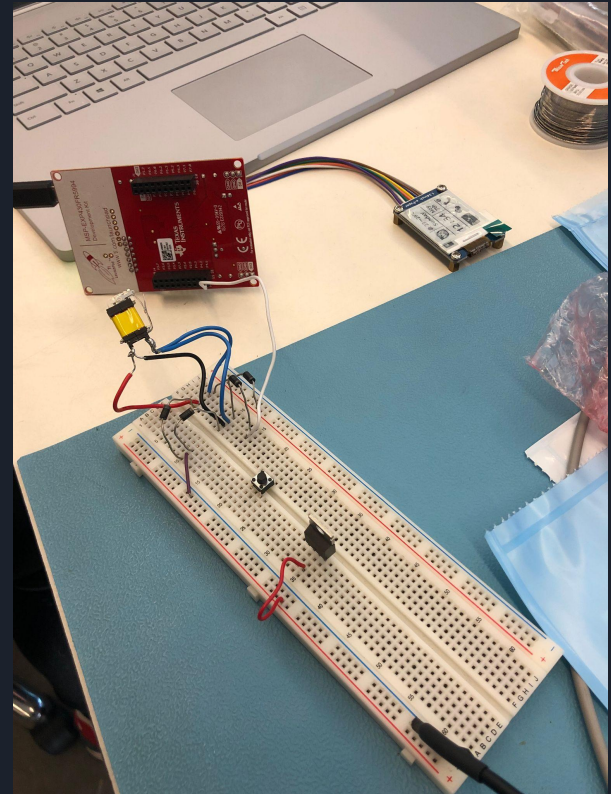


Power System Progress

- Verified compatibility between crank generator, power system, and MSP430
- Powered a simple “blink” program on the MSP430 for over a minute after a 5 seconds of turning the generator
- Supercap can retain ~ 2.5 V for several days with very little loss
- System is ready to begin testing with the E-Ink display and game

Button Trigger GPIO

- Digital IO has 2.6V trigger hysteresis
- Button produces positive and negative wave
- Full bridge rectification
- Current diode drop: 500-700mV





Hardware Update

Challenges:

- Multisource power supplies management
- Efficient button power generation
- Finding the ideal super capacitor size

Next Steps:

- Power source integration
- Powering E-ink and uC with power system
- Power in gameplay implementation
- Overall PCB design



MSP430 MCU Progress

Stage 1: COMPLETE

- SPI Software Interface
- Waveshare E-Ink Display Configuration

Stage 2: IN-PROGRESS

- GPIO: User input software control
 - Buttons, hand crank & DIP switches
 - Interrupt Service Routines
- Low-Power Mode Integration
 - Disabling/Enabling processor & clocks

Goal:

- Interface hardware with MCU for user input control
- Ensure low-power capabilities through ISRs

Challenge:

- Managing the low-power conditions to maintain game program throughout power loss



Software Progress

- Technical challenge:
 - Software testing requires checking hardware settings
 - Limited to certain primitive types
 - Managing state saves with low power mode
- Code abstraction for game logic is ready
- Compute through low power mode library ready to be integrated into the system

Questions?

