Electric Betting System for Poker

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1. Introduction

1.1. Objective

Texas Hold'em is a variant of the card game of poker. Each player in the game is dealt two cards face down and the dealer goes through three rounds of community betting flipping over 5 cards in total. Each player then makes bets on each round based on the strength of their hand. Each player in the game starts with the same amount of money to use while betting. The money is represented using poker "chips," which are small discs that are often made of plastic or clay. Without these chips, playing poker becomes very difficult.

If a group of people wish to play poker, they would need a deck of cards and a poker chip set. The issue is that not everyone owns a poker chip set and those who do only have a limited amount of chips. This restricts the number of people that can play and how much money can be bet. Poker sets can be rather expensive and sometimes if the chips are made from authentic clay, they can chip and break easily. The problem statement that we are addressing is to see if there is a more effective way of playing poker for cheap without worrying about chips.

Our proposed solution is an electronic betting system that completely eradicates the need of physical poker chips. The idea is to have a centralized unit where all betting happens, and each player can see the community pot. Each player will also have their own device that allows them to see their own money and make poker actions such as raising the bet or calling the bet. By taking away the need to use poker chips, everyday people can play poker without having to worry about the financial restraints and the game restraints.

1.2. Background

The idea of removing accessories from games and using an electric alternative has been around for a while. Monopoly Electronic Banking Edition by Hasbro eliminated the need for paper cash that is normally used in games. Instead they created a debit card system, where each player swipes a machine to perform all transactions with the bank or with other players. The purpose of this was to remove the hassle of having so much paper laying around. All the math and counting is done by the middle unit and the player only has to know what action they want to take. The debit cards in this game use magnetic strips to take care of player identification

Our goals are similar to this, but we also wanted to add the feature where each player knows the amount of money they hold as well as the community pot. Instead of using magnetic strips,

our player identification will be handled with RFID readers. The hope for the end-product is that it will be efficient enough to eliminate poker chips, be affordable, and still provide enjoyment to the game.

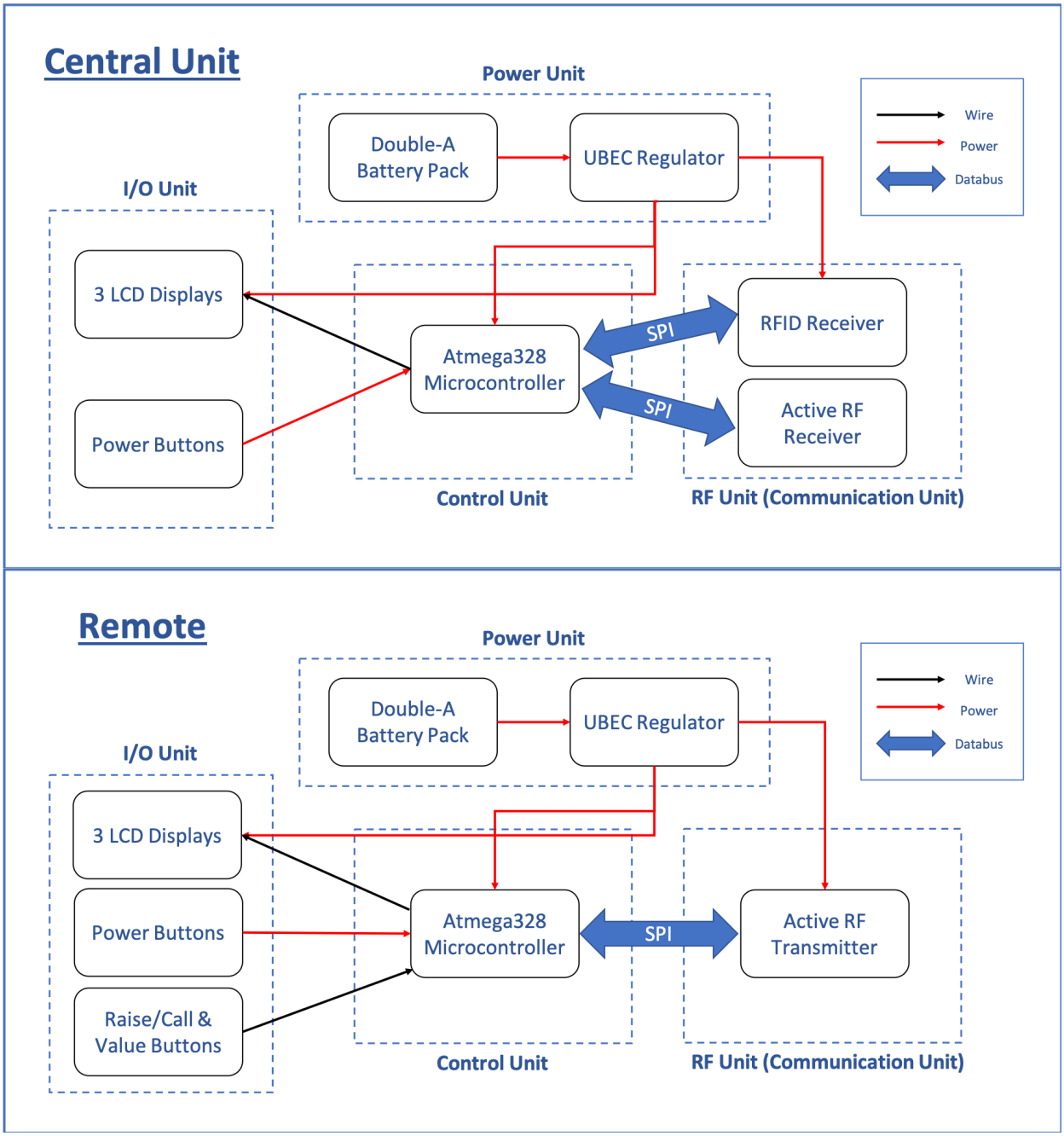
1.3. High-level requirements list

- Devices must be able to communicate with the central hub through RF communication.
- All devices including the central display must be powered with a battery pack.
- Devices and central display will be comprised of low-cost solutions to stay under a proposed budget of $40.

2. Design

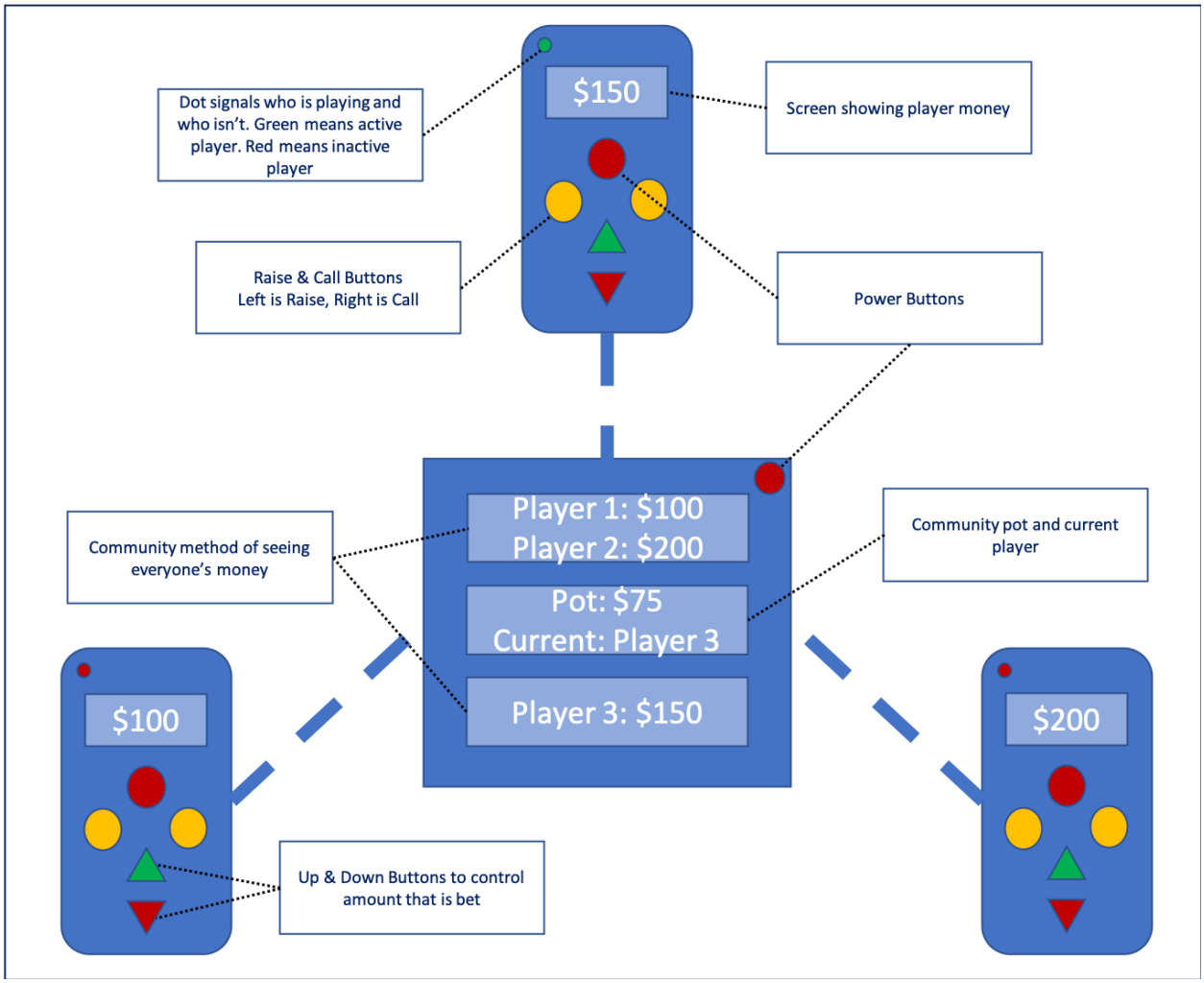
All the devices in our system are going to be powered using a battery pack which will contain 4, 1.5V AA batteries. We will use a UBEC circuit, which is a voltage regulator, to ensure that the voltage supplied to the ATmega328p is nothing more than 5.5V. We will also extend from this regulator circuit to supply voltage to the RioRand LCD displays. The central hub display has three LCD displays, and each external player device will have one LCD display. All our devices will have a power button in order to turn off the device when we do not need it. For proof of concept, we plan to create three player devices. The central hub control unit will be comprised of the ATmega328p microcontroller and a power button. The ATmega328p has 2kB RAM which will be used for storage of the community pot and player amount values. The player device control unit will also be comprised of an ATmega328p microcontroller and a power button. Additionally, it will have four buttons so that the player can increase or decrease the raise amount, raise or call according to his or her decision. We will also have an RF module to connect the player devices to the central hub display for data transfer and maintaining game state.

2.1. Block Diagram



There are two block diagrams included in this proposal because there are technically two components of this system. The first component is the central unit that controls the community view of the game and controls the control of betting. The remote diagram is used to show the components of each players' remotes. Both of the layouts have four main components: an I/O unit, a power unit, a control unit, and a RF Unit which is used for communication. The legend in the corner depicts how each component communicates with one another

2.2. Physical Design



Our physical design consists of essentially a main display device and the remote(s) for each player. On the main display we plan to display:

1) Each Players Total Money
2) Total Pot Money
3) Current Player

The main display will also contain a power button to turn the device on and off. For the remote(s) we plan to display:

1) Player's total money

We will also have various buttons and indicators such as:

1) Call push button

2) Raise push button
3) Up push button (to increase amount you'd like raise by)
4) Down push button (to decrease amount you'd like to raise by)
5) Power button

2.3. Functional Overview

2.3.1. Power Supply

We require a power supply for nearly all our units. We will be using a battery pack with four AA batteries for our power supply.

2.3.1.1. UBEC Voltage Regulator

We will use a standard UBEC circuit to regulate the power from the batteries, so it does not damage the microcontroller and other components. Our main requirement is to reduce the voltage down to 5.5V max for the microcontroller.

2.3.2. Control Unit

The control unit will manage the flash storage and will be programmed via UART. The microcontroller we use will handle signals sent by pushed buttons in order to update game states and values.

2.3.2.1. Microcontroller

We are going to use an ATmega328p microcontroller in order to manage storing data and data transfer, as well has handle signals from various control buttons (raise, call, power buttons). The microcontroller will be powered via UART and will read the signals from the RF module via SPI.

2.3.3. I/O Unit

2.3.3.1. Buttons

2.3.3.1.1. Power Button

This will simply serve as a switch in our circuit to disconnect the voltage source from the rest of the components.

2.3.3.1.2. Up & Down Buttons

These buttons will only be on the player devices, and they will be used to control how much the player wants to increase or decrease a raise.

2.3.3.1.3. Raise Button

This button will be only on the player device, and it will be used to send a signal to transfer the data from the player device microcontroller to the central display microcontroller via the RF module.

2.3.3.1.4. Call Button

This button will only be on the player device, and it will be used to send a signal to the central hub display via the RF module. The central hub display will then automatically update the call amount to the community pot.

2.3.3.2. Displays

2.3.3.2.1. Central Device Display

The central display device will contain three LCD displays, with two of them containing the current players and their current chip amounts. The third one will contain the community pot as well as what player is currently going. The data being displayed on the LCD screens will be coming from the microcontroller storage.

2.3.3.2.2. Player Device Display

The player device will have one LCD screen so that the user can see how much money he/she has left and how much money he/she wants to raise for the current turn. The data being displayed on the LCD screen will be coming from the microcontroller storage.

2.3.4. RF Module

2.3.4.1. RF Transmitter

We will be using a 433Mhz RF transmitter (XD-FST) in our player devices to interact with the central hub device. The requirement here is to successfully connect to the central device and also transfer data bits that the central device needs to update its displays. We will use a parallel connection from the voltage given by the battery pack to supply voltage to this transmitter.

2.3.4.2. RF Receiver

We will be using a 433Mhz RF receiver (XD-RF-5V), which we will supply the 5V DC from the voltage regulator and battery pack. The requirement for this device is to listen for any connections and updates in data bits from those connections, so then we can send it to the microcontroller and then update the LCD displays.

2.4. Risk Analysis

Our communication system between the remote and the main device is a component that poses a huge risk. Our method of using Active RF means we need to have only one remote talking to the main device at time, and thus need to turn off the transmitters of the other remotes to ensure proper communication. We will figure out a solution come design review.

Another risk involving out communications is that since the transmitter and receiver communicate over one frequency band, we are yet to find a way to distinguish between different players.

Essentially, the risks can be boiled down to these two steps: 1) being able to properly communicate between device and remote without interference and 2) being able to distinguish players using the same frequency and properly transmit the correct data between remote and the main device.

3. Ethics and Safety

With any electrically heavy product, safety concerns are quite apparent. In our product specifically, the biggest safety concerns we have are a potential power overload and potential moisture/water short circuits.

Since we have multiple AA batteries (up to 4) powering our devices, it is possible that we could have voltage overload, which will eventually lead to a power overload, causing a potential explosion. We are attempting to regulate the voltage outputted by these batteries using both using a UBEC [1], which is a universal Battery Elimination Circuit, and the resistive capabilities available in the PCBs.

We are also concerned with the potential for moisture/water to get within the devices, whether intentionally or unintentionally. If water gets into the device(s) it will inevitably lead to a short-circuit as the components will be damaged. Since the product is ideally to be used indoors, or in an area where water cannot get into the device, a normal casing should be enough.

The goal of our product is to bring a fun, and fair system to the common or even professional poker player, by eliminating chips from the game and allowing for a fair system of money representation. By doing so we eliminate potential cheating from the game which satisfies IEEE Code of Ethics, #2: “to avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist” [2]. Thus, this product serves to not only allow for more players to participate at once, but also allows for a cheat-free system by getting rid of the need for physical chips.

While our product is meant to be harmless, as poker is simply a card game, it may aggravate certain illnesses such as a gambling addiction. This is in violation of IEEE Code of Ethics, #9: “to avoid injuring others, their property, reputation, or employment by false or malicious action” [2]. With the potential ease of this product, there is a chance of further aggravation to a person’s already harmful addiction. We do not have a means to solve such a health issue - we are assuming that players are playing responsibly and are careful with their money.

4. References

[1] N/A, N/A. “What Are ESC, UBEC and BEC.” *Oscar Liang*, 26 Nov. 2016, oscarliang.com/what-is-esc-uber-bec-quadcopter/.

[2] Publications, IEEE. “IEEE Code of Ethics.” *IEEE - Advancing Technology for Humanity*, www.ieee.org/about/corporate/governance/p7-8.html.