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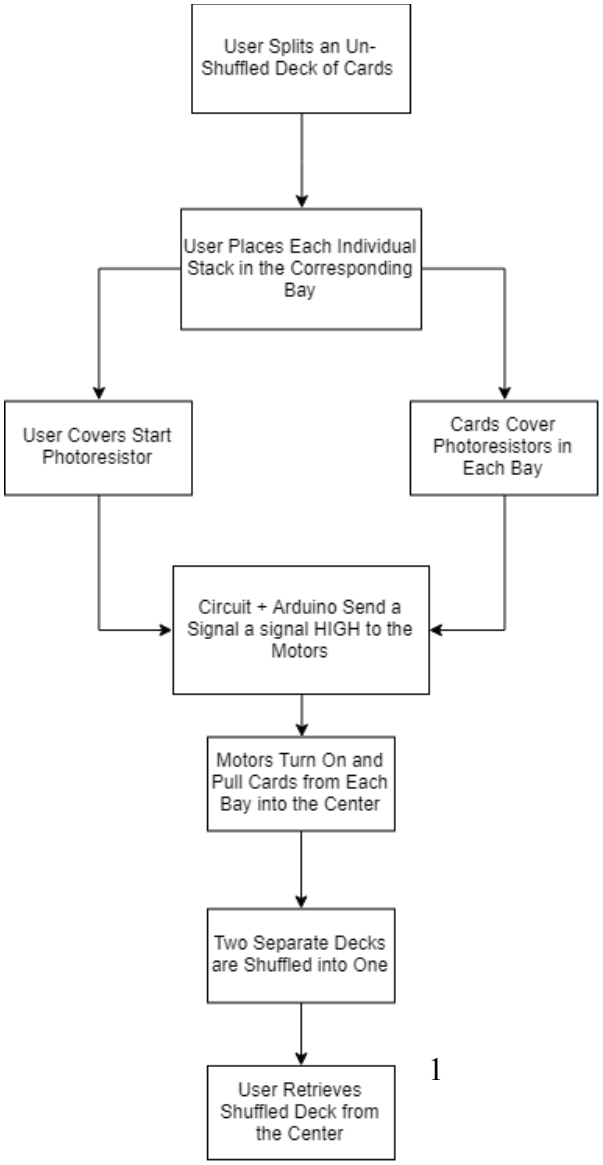
Big Blind Write Up

1. **Introduction:**

Statement of Purpose: Our purpose was to improve the poker playing experience by designing a shuffler which would simplify and standardize the card shuffling process.

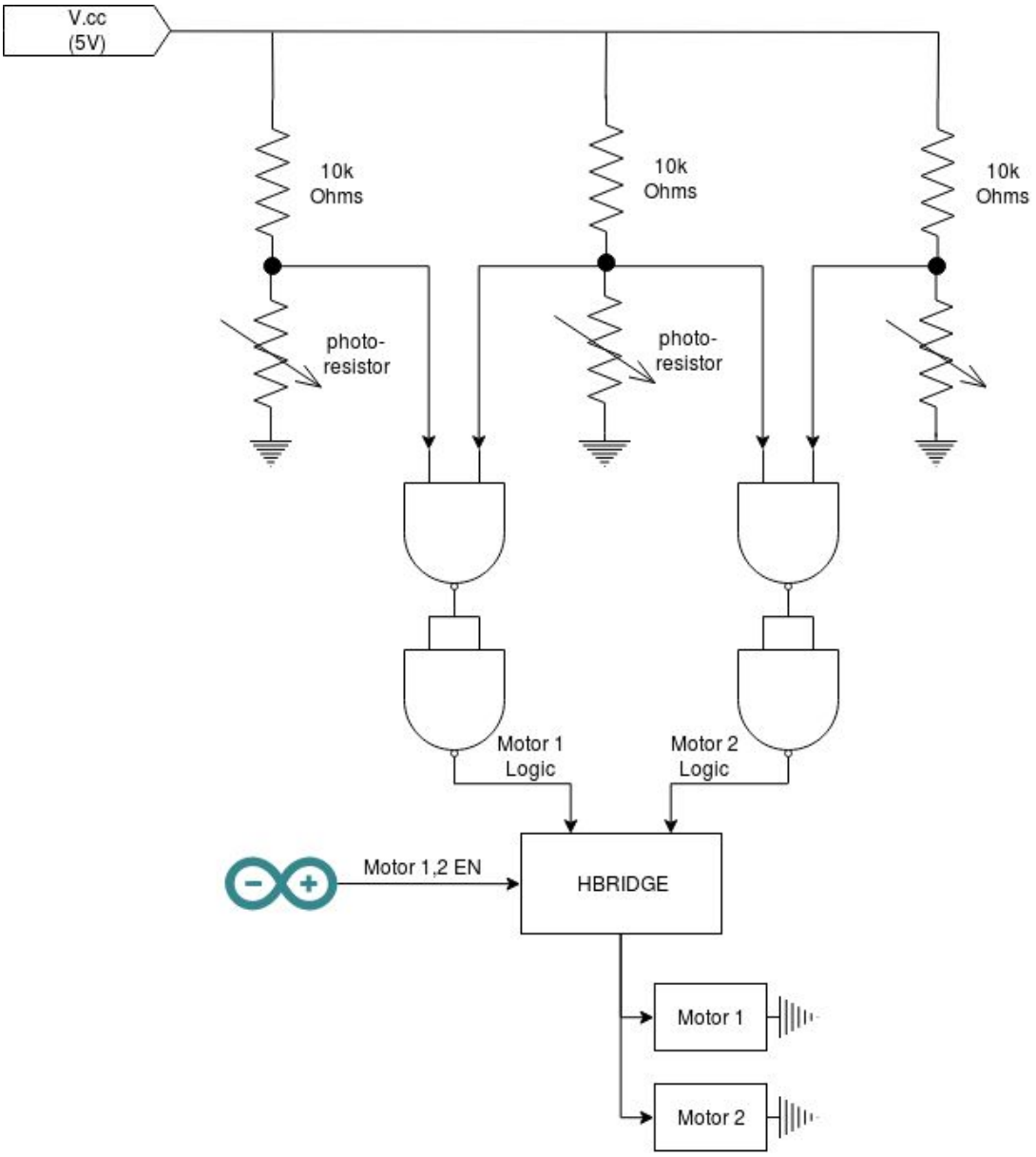
Our card shuffler detects two half decks of unshuffled cards placed on its trays, takes a start command, and shuffles the whole deck randomly. Cheating, bent cards, and (most importantly) boredom is prevented, while the shuffled cards are presented on a tray. A 3D printed body is used for smooth operation and clean design. Logic gates, an Arduino board, two electric motors, an H-Bridge, photoresistors, and resistors make up the circuit. Three inputs are taken by the shuffler via photoresistors, and the cards are shuffled randomly so that the deck is mostly unpredictable. The only time wasting part of any card game is shuffling the deck, and our BigBlind® Card Shuffler brings an end to this. Thanks to this shuffler, any game is more enjoyable and safer for all players now.

2. **Design:**



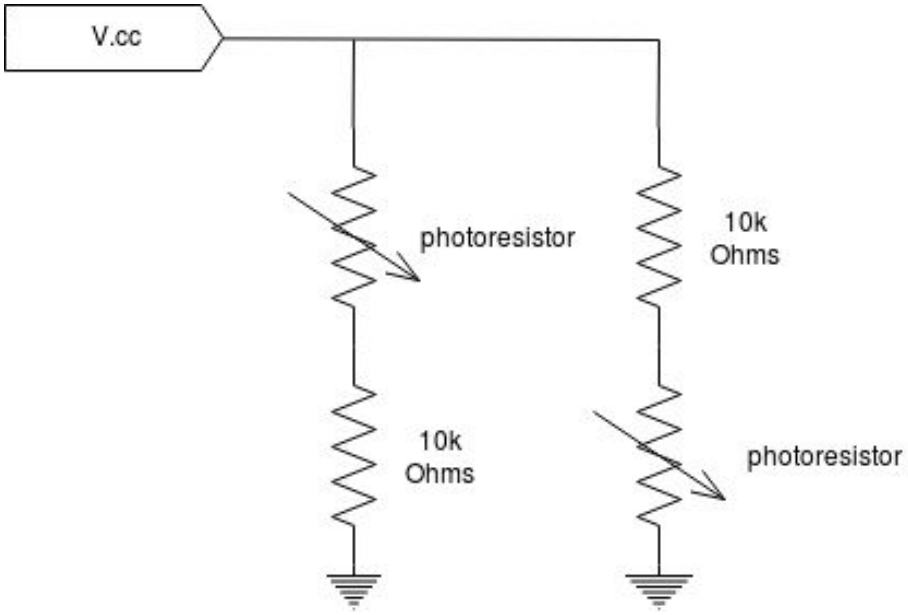
The goal of our contraption is to shuffle two stacks of cards together. This task is accomplished first by the user manually splitting the deck in half and placing each half in separate bays. Once the cards are placed into separate bays, the user covers the shuffle photoresistors. Covering the shuffle photoresistors after loading the bays should turn on each motor. The motors should toss the two individuals decks into each other in the center thus producing one shuffled deck in the center.

3. Results:



Our card shuffler uses three different photoresistors as the control signals to tell the machine when to shuffle. Two of the photoresistors are located in the bays where the cards are stored pre-shuffle. In Appendix A, these photoresistors are the ones on the far left and right. The third photoresistor is used as a user input (in essence, it functions as a button). The user input photoresistor is ANDed together with each of the other photoresistor signals individually. If both the user input and the card bay input are high, the motor for that card bay will begin to turn. The Arduino is feeding the H-Bridge code that turns one motor on for half a second before turning the other motor on for half a second (Appendix B).

A photoresistor functions by having a very low resistance in a well-lit room and a very high resistance in a dark room. It should always be used in unison with a regular resistor. Photoresistors can have two basic configurations, each of which is shown below:



One where the regular resistor is connected to power and the photoresistor is connected to ground (the configuration on the left). Assuming the voltage is measured from the midpoint between the two resistors, this configuration on the left creates a high voltage in a bright room and a low voltage in a dark room. This is because the photoresistor has almost no resistance in the light, so almost all the voltage is dissipated by the first resistor, which means the voltage at the middle node is low. The configuration on the right creates a low voltage in the light and a high voltage in the dark. Our project utilized this configuration because we wanted the signals to be high when the photoresistors were covered.

Other sensors we considered using included push buttons, snap action switches, and weight sensors. All three of these options had major drawbacks. Buttons required a lot of weight to press down, to the point where the cards alone would not be able to push the buttons.

Snap action switches would be very bulky and take up more space than necessary. Weight sensors would work well but would be far more expensive than the photoresistors we decided to use.

4. Problems and Challenges:

The only major problem of our project was about the 3D printed parts. First, we encountered an error while exporting and sending our part file. The dimensions were not exported correctly, so we ended up with a miniature-sized version of the shuffler. After fixing this and reprinting, we were not able to fit the electric motors and the wheels into the shuffler because of the high tolerance values our part had. We overcame this by sanding our printed parts until the wheels were able to turn without any interference. We also had to leave some space between the two parts making up the trays for cards. Finally, as the removable tray for shuffled carts was not able to fit in the shuffler's body (despite our efforts to sand it down to a fittable size), we had to remove that part and have the cards delivered directly on the base of the shuffler's main body.

Another problem was that the cards sometimes got jammed because the space between the two wheels was not sufficient. We tried to solve this by designing our unshuffled card decks inclined at an angle so that the cards wouldn't fall horizontal to the base. However, our shuffler's behavior is still unpredictable regarding this issue.

5. Future Plans:

If we had more time, we were planning to design a card dealer integrated with the shuffler. Users would have the option to have the cards shuffled only, or shuffled and dealt. The dealer would have an input for determining the number of players and another input (e.g. a push button or a photoresistor) for starting operation. It would use a servo motor in order to deal with the shuffled cards with a circular motion. Players would then retrieve their own cards from the indicated trays.

Another idea we came up with was a chip counter for poker players. This counter would have separate piles of chips according to their values. It would weigh each pile and determine how many chips of each type are present. It would take input for the amount you want to put on the table, and prepare the right combination of chips on another tray. At this point, the user would have two options: either retrieve the chips and place them on the table by hand or have the chip counter catapult them into the middle in an aggressive manner.

6. References:

We watched a commercial product video before starting to plan our project, in order to get an idea of how our shuffler can work. This helped us

IEEE Citation:

[1]"Automatic Card Shuffler", *YouTube*, 2019. [Online]. Available: https://www.youtube.com/watch?v=y6Xy6wd5cno. [Accessed: 05- May- 2019].