

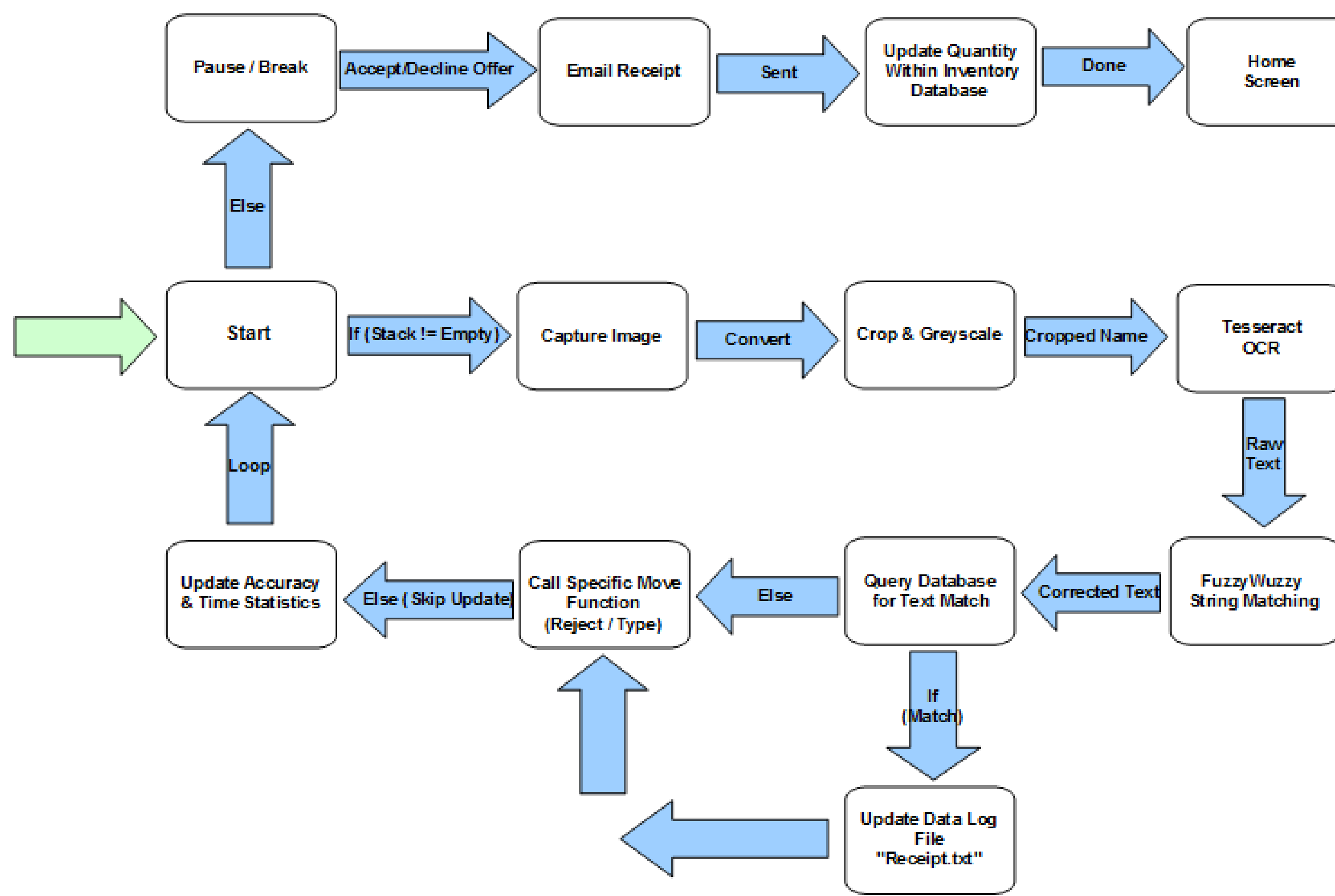
Objective Statement

Our goal was to design a device that would allow someone (typically a card retailer) with no knowledge of trading card games to insert cards into the device and in return, the automated device will retrieve and display the price of all the cards highlighting any specific information that they would want to know, keep track of each card that was scanned and then sort them in stacks based on what they decide to categorize them by. The device will not only handle cost estimation and sorting, but will also be capable of updating and maintaining a fully integrated inventory of all cards available by that merchant.

Background

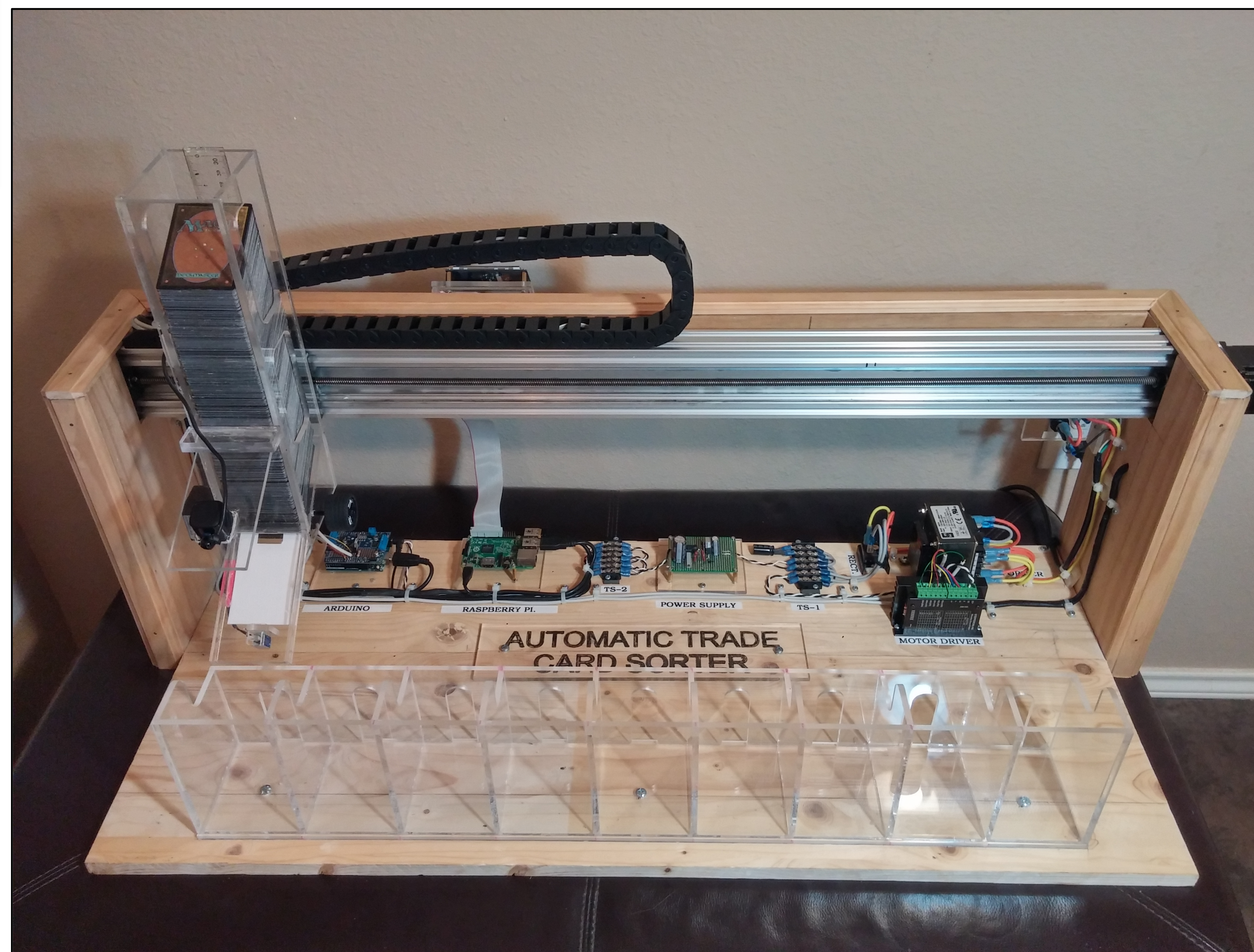
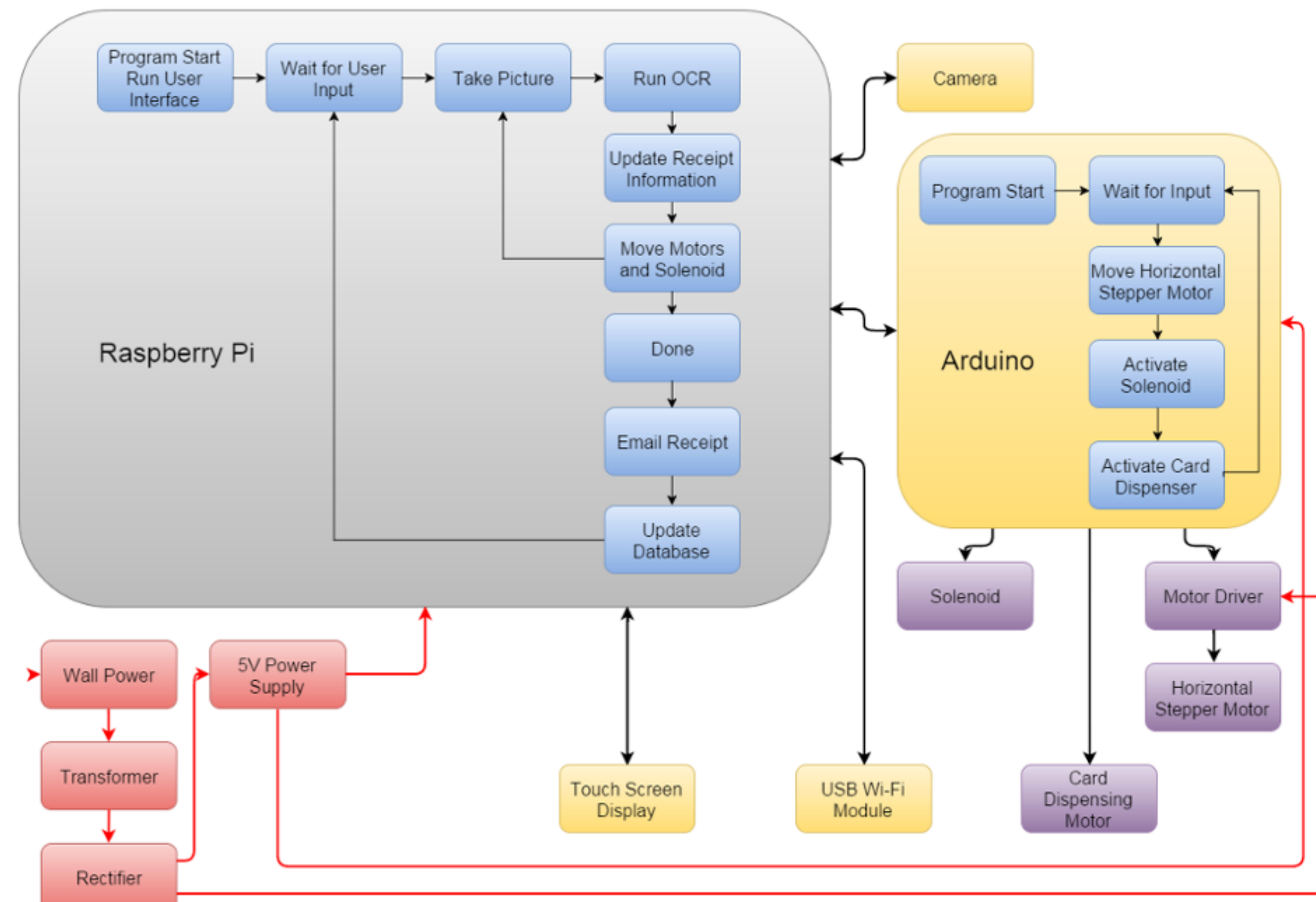
The secondary market for trading card games is a huge market with the rise of organized tournaments, and a growing population base of trading card game players. Buying and selling magic cards has now become a significant source of income in numerous businesses across the globe. Trading card games have an expansive and consistently growing market covering a large platform of sales, anywhere from TCG collectors buying collections to be resold to other players, to store owners selling singles to generate revenue, or online retailers buying and selling in large enough quantities that they have the ability to dictate the fair market value.

Software Behavioral Model



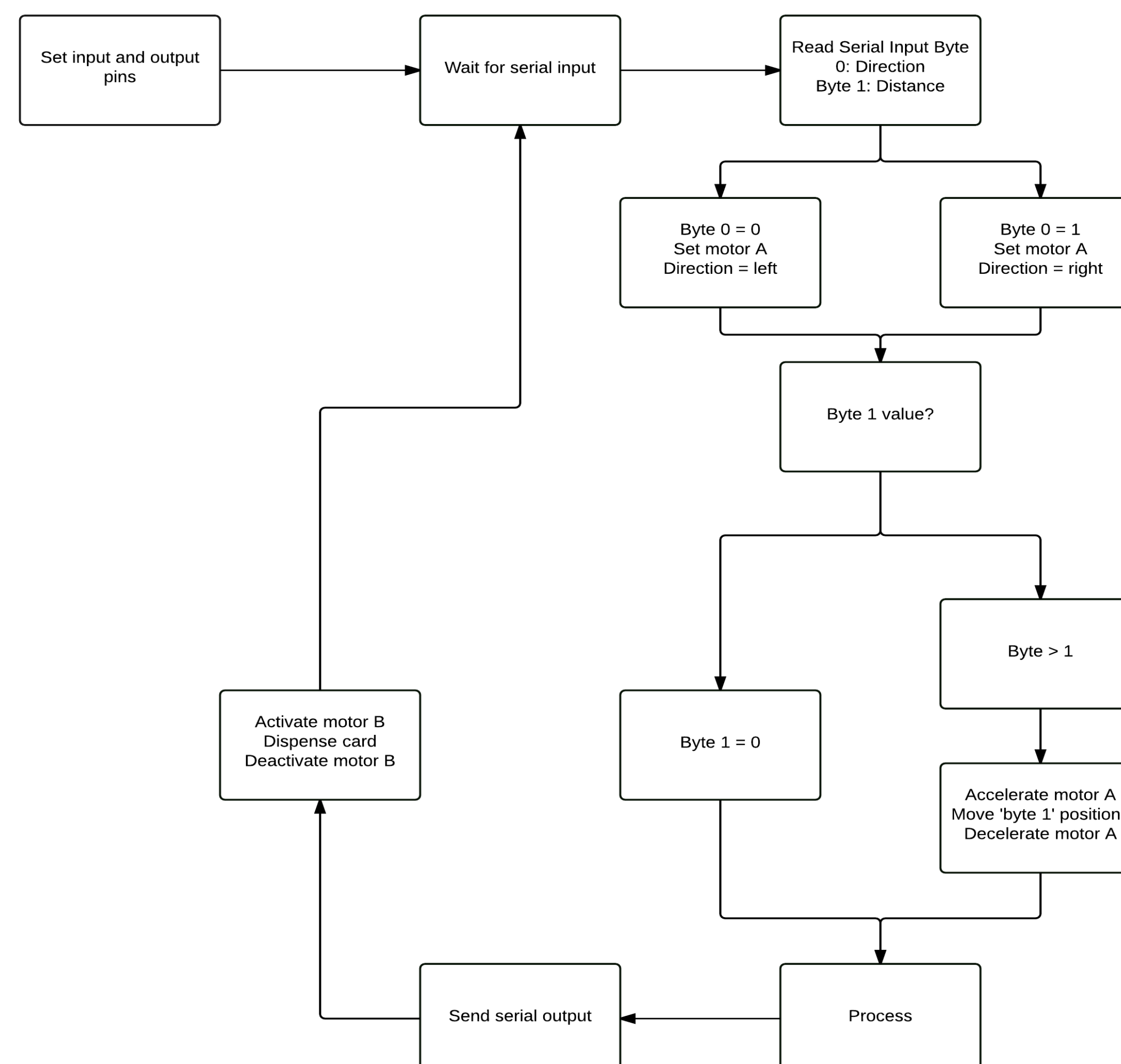
Behavioral Description

- Initially the cards will be inserted into the device and the user will interact with our interface and select all of the necessary settings for sorting and inventory then the user will start the device and the sorting process.
- Next a single card will be removed from the stack and moved to a controlled imaging platform area for the card image to be captured. Once the card is in position the microcomputer will send a signal to the image capture device to take the picture.
- After the picture is taken the image is sent to the microcomputer to be processed. First the image has to go through a pre-processing phase before it is sent to the optical character recognition program. In this stage the image will be cropped and the contrast will be adjusted in order to generate the best possible representation of our points of presentation.
- After these cropped images are generated they are ran by our optical character recognition program which will read in picture and output a text string with the suspected characters related to the image.
- Then this text file will be run through a string matching algorithm to ensure that the words that we search in our database are the correct strings. Next we search our database for the card title and if the card title is found, we look at that card's attribute related to our chosen sorting option.
- Next we export that card information into a separate file in order to create the temporary log file for the user. After that our script will identify the term that we are sorting by and the sorting mechanism will determine what stack the card needs to be placed in.
- After we determine where the card needs to be the system will then shift to that desired sorting state and the card will be moved from the image platform into its individual state. This process is repeated until the system no longer recognizes a card is in the dispenser card rack.
- Afterwards the device will enter its end of transaction protocol in which it will begin by displaying the temporary card information summary generated during the sorting process and ask the user if the offer is accepted.
- If the offer is accepted the script will update the onboard database quantity with the card quantities listed in the temporary log.
- Next it will ask the user if they want an emailed copy of the log summary. If they choose the "send email" option the system will request the user's email address and will attach the temporary log summary to an email and send it to the user using the selected mail transfer agent.
- Lastly the onboard temporary card summary will be deleted to conserve memory space and the device will return to its initial position.



Hardware Behavioral Description

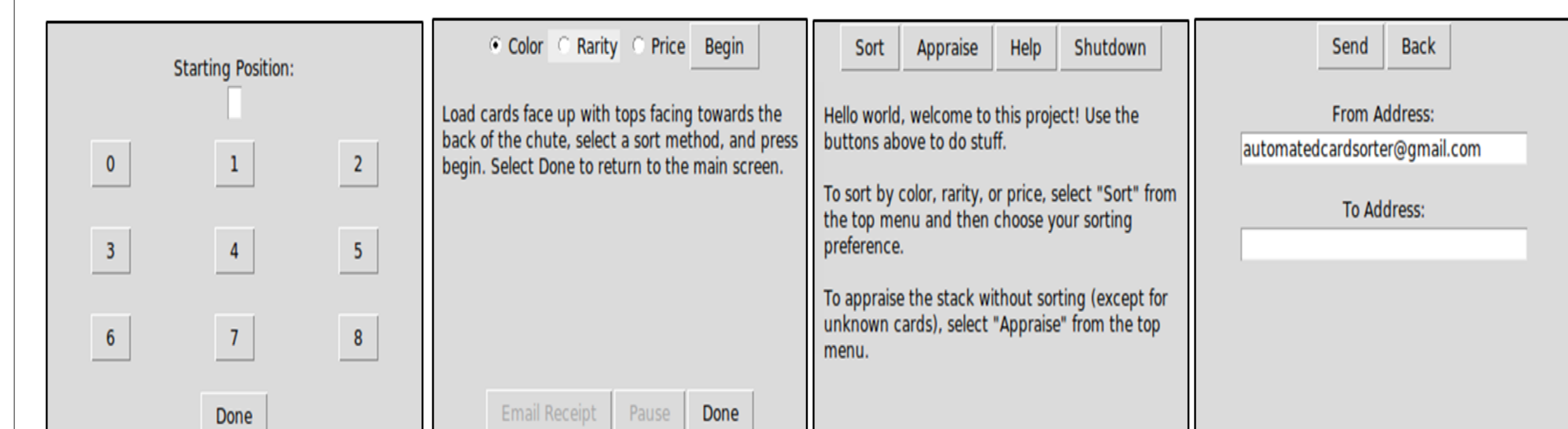
Once our device receives an input of two bytes in the serial monitor it will first check the first byte and if that byte is a zero it configures the driver of the Nema 23 to prepare to spin the motor to the left. If that byte is one it configures the driver to spin the Nema 23 to right. Next it checks the second byte and if that byte is greater than zero our Arduino sends square wave pulses to our ST6600 driver that performs micro stepping to move our motor. First it ramps up to speed by decreasing the pulse width of the square wave until it reaches a top speed and then it moves a fixed distance based on the number stored in the second byte of the serial monitor and then it lowers the frequency until the chute stops in front of the desired location. After movement on this motor is completed, the Arduino will send a serial output to signal that the device is done moving. The next step is the Arduino sends a signal to activate the solenoid which will release the card from the chute. If the second byte was 0 then the process skips the movement phase and goes straight to this point after the direction is set. Next the Arduino clears the buffer and returns to the beginning of the



Engineering Specifications & Statistics

Modes of Operation	1. Sort by Card Color/Type 2. Sort by Card Rarity 3. Sort by Card Value 4. Value Appraisal Only
Accuracy	91.75%
Speed	10.2 Seconds/Card
Storage Capacity	915 Cards
Machine Cost	Less than \$400.00
Weight	32 Pounds
Dimensions	Height = 14 ½ in Width = 39 ¾ in Depth = 17 ½ in

User Interface – General Layout



The mockup shows a user interface with a starting position indicator, a numeric keypad (0-9), and buttons for 'Done', 'Email Receipt', 'Pause', and 'Done'. It also includes a 'Sort' menu with options like 'Appraise', 'Help', and 'Shutdown'. A 'Send' button is present, along with fields for 'From Address' (automatedcardsorter@gmail.com) and 'To Address'.