Open CV Project (a.k.a. Stack-rite System)
1/9/2022

PHASE 1 - Main GUI, pre-built stack recipe database, discs manually stacked with no starting locations needed for discs, program records and outputs video file of stack process.

Process steps

- Start program
- Program brings up GUI
- Operator enters name in field
- Operator picks a pre-set PN from drop-down menu
    - Program pulls PN information from database (a.k.a. Stack Recipe) and displays graphic showing what the stack should look like
- Operator clicks on Start Recording button
    - Display on GUI a Recording Started message
    - Program starts recording a video file with the following file format: PN_Operator Name_Date_Time
- Operator stacks disc in Target Stack Area
- Camera continuously watch Target Stack Area from side with the GUI showing the camera display in a box next to the required Stack Recipe graphic and, once stack is correct, displays an indicator on the screen that stack created meets requirement.
    - Continue to record for a few seconds after success and stop recording automatically.
    - Display on GUI a Recording Stopped message
    - Program finalizes and saves video file. This file saves the configuration history of each part built for future reference or audit by Quality or the customer

PHASE 2 - Main GUI display, pre-built stack recipe database, starting positions for stacks of discs ready to stack, discs automatically stacked with Lego Mindstorm system, program records and outputs video file of stack process.

Process Steps

- Start program
- Program brings up GUI
- Operator enters name in field
- Operator picks a pre-set PN from drop-down menu
    - Added-on option of having a button on main GUI that goes to a secondary GUI where operator can add a PN and stack recipe to the database
- Program pulls PN information from database (a.k.a. Stack Recipe) and displays graphic showing what the stack should look like
- Operator clicks on Start button

    - Program starts recording a video file with the following file format: PN_Operator Name_Date_Time
- Program uses camera to note which Disc Starting Position has which color
- Program interfaces with Lego Mindstorm and sends instructions to run it's program to pick and place the Stack Position 1 colored disc on to the Target Stack Area
    - Lego Mindstorm pick and place will have 3 programs, 1 for each Disc Starting Position.
    - End of Lego Mindstorm program sends unit back to home position
- Program uses camera to verify correct disc was stacked in Target Stack Area
- Repeat previous 2 steps until stack is completed
- Camera continuously watch Target Stack Area from side with the GUI showing the camera display in a box next to the required Stack Recipe graphic and, once stack is correct, displays an indicator on the screen that stack created meets requirement.
    - Continue to record for a few seconds after success and stop recording automatically.
    - Display on GUI a Recording Stopped message
    - Program finalizes and saves video file. This file saves the configuration history of each part built for future reference or audit by Quality or the customer

Hardware

PHASE 1

- ☐ Lighting — need consistent even lighting for camera
- ☐ Camera Mount — need height and angle adjustable (tri-pod)
- ☐ Base — Lego bed plate
- ☐ Target Stack Area — make from Legos

PHASE 2

- ☐ Pick and Place — build from Lego Mindstorm system

Software Functions

PHASE 1

- ☐ Distinguish color of an object
- ☐ Distinguish the position of an object (Target Stack Area positions 1-4)
- ☐ Compare the color of object in Target Stack Areas to the expected colors from Stack Recipe picked by Operator from database
- ☐ Setup Stack Recipe database
- ☐ Display Stack Recipe Graphic on GUI

- [ ] Display Video from camera on GUI
- [ ] Create GUI (see GUI IDEA - MAIN SCREEN in Google Docs)
- [ ] Start video record
- [ ] Stop video record
- [ ] Save video to specific file format
- [ ] Combine functions above to perform Phase 1 Process Steps

PHASE 2

- [ ] Distinguish the position of an object (Disc Starting positions 1-3)
- [ ] Take Stack Position colors from Stack Recipe and distinguish with Disc Starting position has those colors
- [ ] Program Lego Mindstorm with 3 programs to pick from: 1 each for the Disc Starting positions)
    - [ ] *Lego programs will move from home position to Disc Starting position picked, pick up a disc, move to Target Stack position, place the disc and return to home position

      *May need to figure out how to adjust vertical pick and place positions based on the Target Stack already having discs in place and/or the Disc Starting position having discs already removed.

- [ ] Additional GUI screen for adding PN Stack Recipes (see GUI IDEA - PN INPUT SCREEN from Google Docs)
    - [ ] A button on MAIN GUI will need to be added to go to this screen
    - [ ] This may be a “nice to have if we have time.”
- [ ] Combine functions above to perform Phase 1 Process Steps

Additional Ideas

- [ ] Camera to recognize if a hand comes into view and it sends a PAUSE or STOP signal to the Lego Mindstorm
- [ ] Add a button to start a new part stack on MAIN GUI; otherwise operator would have to start and re-start program
- [ ]