

Project Checklist

The Commitment

- **Video_decoder** - This module will output a 30 bit YCrCb value from the camera, and will be capable of showing RGB feedback from the camera. This can be displayed on the VGA monitor.
- **RGB2HSV** - This module converts a 24 bit RGB pixel to HSV. We plan to successfully implement this module to use HSV filtering. We can prove this module is successfully implemented by having successful filtering based on HSV values.
- **ntsc_to_zbt** - This module generates an address and stores a filtered image in ZBT memory. It can be demonstrated by displaying the VGA monitor, as the images being stored in ZBT are displayed on the monitor.
- **Filter** - This module filters out most noise, but keeps the markers on the tank. We will filter on either hue, or both hue and value. We can display this filtering through showing the filtering on the VGA display.
- **I2C_master** - This module allows the Labkit to act as an I2C master to communicate with the touchscreen controller. It controls the SDA and SCL lines as appropriate and outputs the values in the registers it read. This module can read four consecutive registers at once. We can demonstrate this by reading the appropriate x and y position registers, and displaying it on the hex display of the labkit. As you move the finger across the touch screen, those values should change appropriately.
- **Touchscreen** - This module uses the I2C_master to read the x and y position as well as whether there is a touch on the screen. See above for explanation of proof of function. This module serves to encapsulate what we need from the touchscreen, and allow for expansion of functionality.
- **Draw_trace** - This module uses the Bresenham's line drawing algorithm to display the path that the user traces on the touchscreen on the VGA screen. We can prove this by tracing a path on the touchscreen and see it displayed on the VGA.
- **Draw_tank** - This module displays the the last position of the tank as a colored square. We can prove this by touching the touchscreen and the colored square will move on the VGA screen appropriately.
- **Hardware_control** - When given the appropriate input, (ex. Left = 1) This module outputs pwm logic signals to control the remote controller of the tank. The logic signals turns on and off NFETs that control the remote. There are four possible directions: left, right, forward, reverse. We can test the functionality of this module by commanding each of the directions, and see the tank move.
- **Control_FSM** - This module determines the state of the tank. It takes the output from touchscreen and position from the camera feedback and puts the tank in the appropriate state: initializing, moving to target, and arrived at target. During the moving to target state, it outputs signals to Hardware_control to move the tank as appropriate. We can demonstrate functionality by having the tank successfully reach a series of distinct points (3 points) as opposed to a continuous path. We can test each state of this FSM by holding a finger down in one position (initialization) and see that the tank moves to that

corresponding spot. We can then provide different points for the tank to move to through the touchscreen and see that the tank moves to the corresponding spot.

The Goal

- **Frame_buffer** - This module will store the last eight center of mass values in a circular buffer, and will average the eight values stored in the buffer. We can demonstrate this by using cross hairs to show the center of mass both with and without the frame buffer.
- **Filter** - This module will filter out almost all noise and gets an accurate image of the trackers on the tank. We again can show this on the VGA monitor.
- **Control_FSM** - This module will enable the tank to follow a path drawn by the finger, not just reach distinct points determined by the finger. This can be demonstrated by drawing a path on the touchscreen and having the tank follow the path in real time.

The Stretch Goals

- Display the camera's feed onto a VGA monitor as the tank drives around.
- Overlay the touch screen path onto the VGA monitor screen.
- Create a sprite(not just a square) for the tank and a more interactive user interface.