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SUBJECT: Ping-Pong Machine Firmware/Image Status

This is to provide an update for the progress in the development of the firmware for the Smart Ping-Pong Machine. The firmware is currently being developed on a Raspberry Pi 4. The development platform is running on the Raspian OS and it is programmed in *python* language. The IDE being used for this development is *ThonnyPython.* The image of Raspian being used for the development was the one provided by Humber College. It has been set up to allow remote access, using an Ethernet cable and Ethernet-USB adapter to connect to any PC or laptop. The Raspian OS image has been configured to allow remote access and can be accessed using CLI with Putty and using GUI with VNC viewer. The firmware is developed to control the Servo motor, the solenoid and Dual DC motor driver. The code for firmware is now an integrated version of the base code for the prototypes for the given devices. The new firmware was developed using the code for the dual motor driver as base. The present version is not setup to get the play difficulty values stored in the firebase by the mobile application. But in the present version of the code play settings are hard-coded in the code and for a later version, a defined function can be added to get the values from the firebase periodically and use them to run the devices to provide a play level according the settings set by the user. The firmware uses the *GPIO* and *time* module from the Raspberry Pi *python* modules. The *GPIO* module functions are used to use the In/Out pins of the Raspberry Pi in BOARD setting. During the initial setup, 5V outputs are set to turn on the VCCs for the motor driver and the Servo motor. Also, GPIOs used for the Motor Driver logic and the Solenoid are set to output and the 3 PWM outputs to control the Servo motor and the two DC motors. The PWMs are setup to output a 100Hz frequency to provide easy calculation for the value of Duty Cycle needed for favorable physical output from the DC motors and the Servo motor. After the setup is completed by making sure that the GPIOs that control the motors and the solenoid are set to the values of HIGH and LOW as needed to set the solenoid in position and the directions for the motors are set. There are different functions defined to simulate the different shots for the Ping-Pong ball, serve up the ball at the given intervals and turn the machine at a variable angle. The firmware runs in a loop to systematically and periodically, serve up the ball then launch the ball straight. Then the loop runs while turning the angle periodically and alternating between the straight shot, top spin and back spin shots. The angle variation is random, ranging between zero to fifty degrees. For the upcoming version, the defined function needs to be implemented that periodically updates the currently hard-coded values for angle, interval and difficulty.