

Figure 1: Black Box Block Diagram

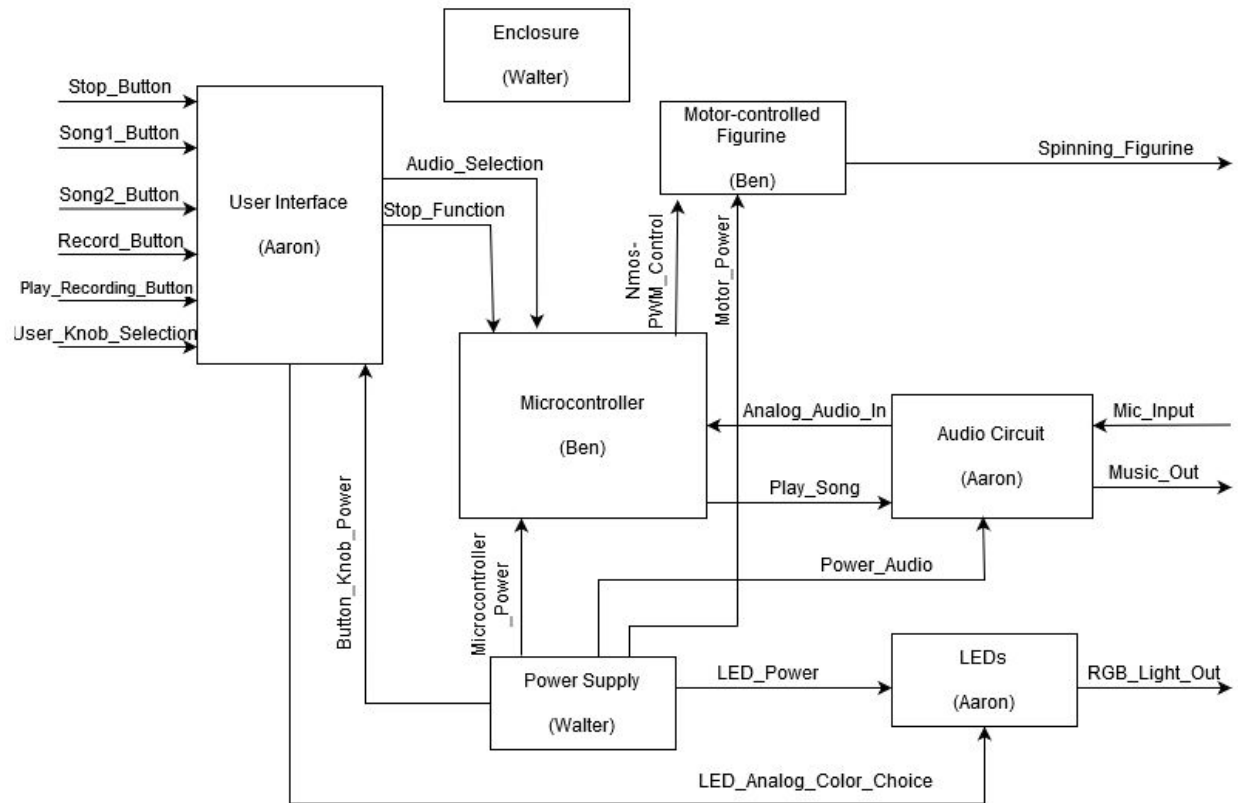


Figure 2: Top-Level Block Diagram

Interface Name	Interface Definitions
Stop_Button	<ul style="list-style-type: none"> ● Digital HIGH (5V) or LOW (0V) ● Not pressed = LOW via pull-down resistor ● Button that the user can press to stop the current audio function ● Vmin: 0V ● Vmax: 5V ● Vcc: 5V ● Imax: 1A
Song1_Button	<ul style="list-style-type: none"> ● Digital HIGH (5V) or LOW (0V) ● Not pressed = LOW via pull-down resistor ● Button that the user can press to play the first pre-recorded song (DK Rap) ● Vmin: 0V ● Vmax: 5V ● Vcc: 5V ● Imax: 1A
Song2_Button	<ul style="list-style-type: none"> ● Digital HIGH (5V) or LOW (0V) ● Not pressed = LOW via pull-down resistor ● Button that the user can press to play the second pre-recorded song (Gangplank Galleon) ● Vmin: 0V ● Vmax: 5V ● Vcc: 5V ● Imax: 1A
Record_Button	<ul style="list-style-type: none"> ● Digital HIGH (5V) or LOW (0V) ● Not pressed = LOW via pull-down resistor ● Button that the user can press to begin recording 20 seconds of audio ● Vmin: 0V ● Vmax: 5V ● Vcc: 5V ● Imax: 1A
Play_Recording_Button	<ul style="list-style-type: none"> ● Digital HIGH (5V) or LOW (0V) ● Not pressed = LOW via pull-down resistor ● Button that the user can press to play the recorded audio file ● Vmin: 0V ● Vmax: 5V ● Vcc: 5V ● Imax: 1A

User_Knob_Selection	<ul style="list-style-type: none"> • 3 Analog Knobs (Red, Blue, Green) • User adjusts knobs to create different color combinations and intensities on the RGB LEDs • Vcc: 5V • Rmin per Knob: 100 Ohms • Rmax per Knob: 10 kOhms
Audio_Selection	<ul style="list-style-type: none"> • Digital HIGH (5V) or LOW (0V) • Prompts the microcontroller block to begin one of four audio functions depending on which button was pressed • Vmin: 0V • Vmax: 5V • Imin: 0A • Imax: 40mA • Inom: 20mA
Stop_Function	<ul style="list-style-type: none"> • Digital HIGH (5V) or LOW (0V) • Prompts the microcontroller block to stop all audio functions if the stop button was pressed • Vmin: 0V • Vmax: 5V • Imin: 0A • Imax: 40mA • Inom: 20mA
LED_Analog_Color_Ch oice	<ul style="list-style-type: none"> • Analog Signal • Specifies the color and intensity of the RGB LEDs depending on the knob adjustment levels • Vmin: 0V • Vmax: 5V • Imin: 0A • Imax: 80 mA
Button_Knob_Power	<ul style="list-style-type: none"> • DC Signal • Supplies power to the buttons and knobs on the User Interface • Vmin: 4.5V • Vmax: 5.5V • Vnom: 5V • Inom: 100mA • Ipeak: 150mA

Play_Song	<ul style="list-style-type: none"> ● PWM Signal ● Outputs audio signal corresponding to the user selected song to the Audio Circuit for filtering and amplification ● Vmin: 0V ● Vmax: 5V ● Imin: 0A ● Ipeak: 40A
Analog_Audio_In	<ul style="list-style-type: none"> ● Analog signal ● Generated signal from the Audio Circuit microphone received by the Arduino UNO for recording ● Vmin: 0V ● Vmax: 5V ● Imin: 0A ● Ipeak: 40A
Nmos_PWM_Control	<ul style="list-style-type: none"> ● PWM Signal ● Used to control when the figurine spins as well as the RPM of the figurine ● Sent to gate of nmos transistor ● Vmin: 0V ● Vmax: 5V ● Inom: 0A ● Ipeak: 0A
Microcontroller_Power	<ul style="list-style-type: none"> ● DC Battery Voltage ● Powers the Arduino UNO ● Vmin: 6V ● Vmax: 20V ● Vnom: 9V ● Inom: 1A ● Ipeak: 1.5A
Motor_Power	<ul style="list-style-type: none"> ● DC Battery Voltage ● Powers the motor on the Motor-Controlled Figurine ● Vmin: 0V ● Vmax: 5V ● Vnom: 5V ● Inom: 100mA ● Imin: 0A ● Ipeak: 400mA

Mic_Input	<ul style="list-style-type: none"> • Analog Signal • Audio played to the microphone on the Audio Circuit • Freqmin: 20 Hz • Freqmax: 8 kHz
Music_Out	<ul style="list-style-type: none"> • Audio • Speakers on the Audio Circuit produce audio depending on the input to the Audio Circuit in Play_Song • Freqmin: 20 Hz • Freqmax: 20 kHz
Power_Audio	<ul style="list-style-type: none"> • DC Linearly Regulated • Vmin: 4.5V • Vmax: 5.5V • Vnom: 5V • Inom: 300mA • Ipeak: 600mA
Spinning_Figurine	<ul style="list-style-type: none"> • DK Figurine • Spins when music is playing, doesn't spin when music is not playing • Max RPM: 24
LED_Power	<ul style="list-style-type: none"> • DC Linearly Regulated • Vmin: 4.5V • Vmax: 5.5V • Vnom: 5V • Imin: 0A • Ipeak: 80mA
RGB_Light_Out	<ul style="list-style-type: none"> • 6 RGB LEDs • Analog brightness chosen by user via knobs • Analog color chosen by user via knobs

Table 1: Interface Definitions