Homework 5 - Functional Decomposition
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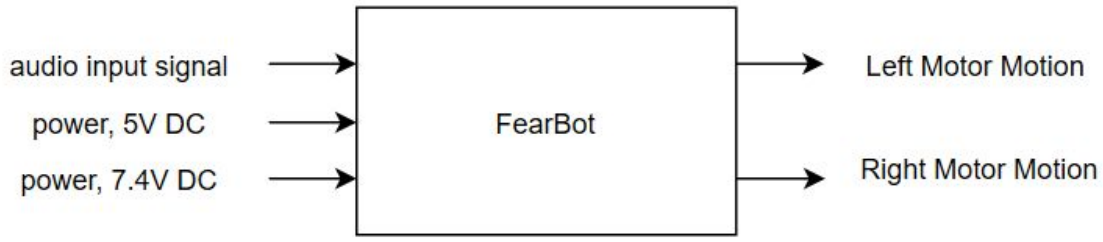
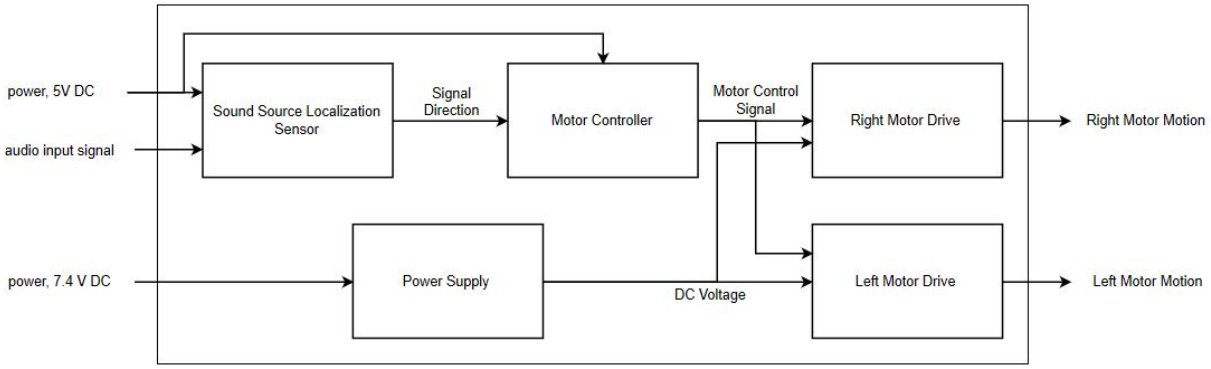
Date: 11/11/19

High Level Block Diagram



Next-Level Block Diagram

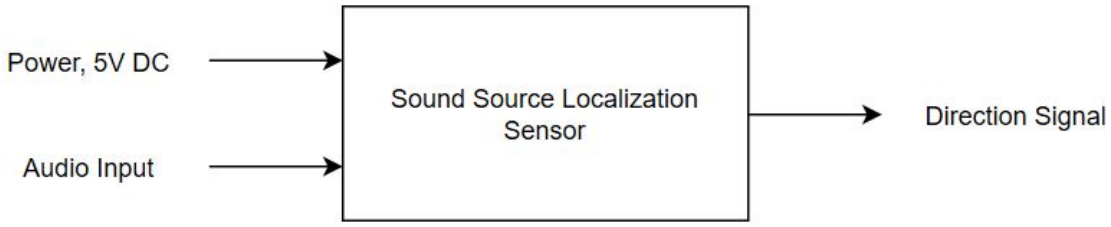


*The Motor Control Signal consists of four lines, a reverse and forward enable signal for both right and left drivers

Module	FearBot
Inputs	Power, 5V DC: 5V DC with up to 2.1A of current Power, 7.4V DC: 7.4V DC with up to 1.5A of current Audio Input Signal: 20Hz - 20kHz, 20 x 10^{-6} Pa - 2kPa
Outputs	Right Motor Motion: Shaft turns a right wheel @ a specified RPM Left Motor Motion: Shaft turns a left wheel @ a specified RPM
Functionality	Receives audio input signal to produce turning motor motions of a left and right wheel. Wheels turn in a way to orient Fearbot opposite to the direction of audio input signal source and then drives some distance away from the source.

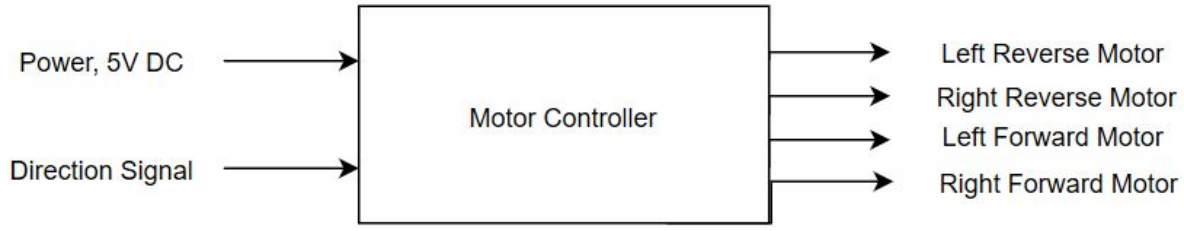
Module Block Diagrams

1. Sound Source Localization Sensor



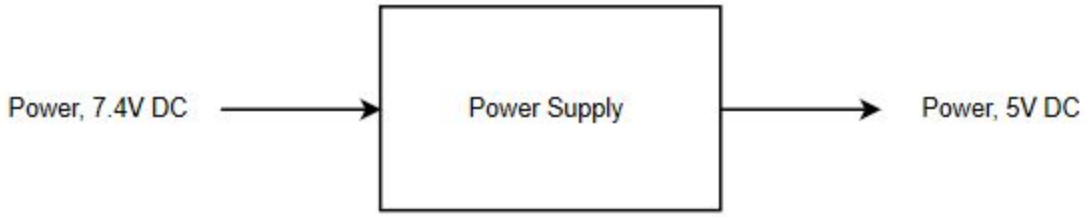
Module	Sound Source Localization Sensor
Inputs	Power: 5V DC with up to 2.1A of current Audio Input Signal: 20Hz - 20kHz, 20 x 10^{-6} Pa - 2kPa
Outputs	Direction Signal: Gives the direction of origin of detected sound relative to the orientation of the device.
Functionality	Takes the audio information from an array of microphones, doing cross-correlation comparisons to determine the direction of origin of an audio source.

2. Motor Controller



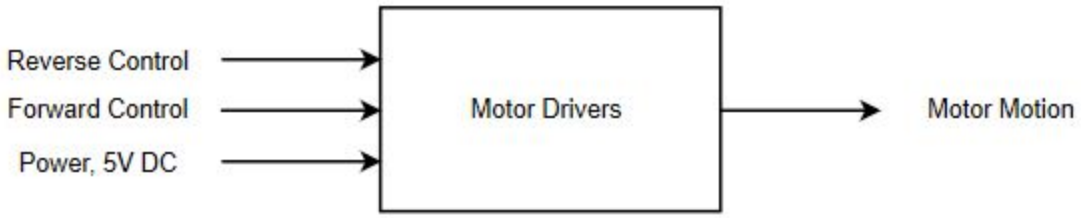
Module	Motor Controller
Inputs	Direction Signal: Gives the direction of origin of detected sound relative to the orientation of the device, alongside the magnitude of the detected sound.
Outputs	Left Reverse Motor: PWM Signal, 5V Peak Right Reverse Motor: PWM Signal, 5V Peak Left Forward Motor: PWM Signal, 5V Peak Right Forward Motor: PWM Signal, 5V Peak
Functionality	Takes the direction signal and activates the motors such that the device orients itself in the opposite direction of the sound source, and then moves a distance away from the source.

3. Power Supply



Module	Power Supply
Inputs	Power: 7.4V DC
Outputs	Power: 5V(± 2%) DC with up to 1.5A of current
Functionality	Convert 7.4V DC battery voltage into 5V DC output for powering DC motors

4. (Left or Right) Motor Driver



Module	(Left or Right) Motor Driver
Inputs	(Left or Right) Reverse Control: PWM signal, 5V Peak. When enabled the wheel moves in the reverse direction. (Left or Right) Forward Control: PWM signal, 5V Peak. When enabled the wheel moves in the forward direction. Power: 5V DC
Outputs	(Left or Right) Motor Motion
Functionality	H-Bridge driver that supplies power to the left or right wheel motor, with the amount of power proportional to the duty ratio of the PWM inputs. The amount of power supplied determines the speed of the device. Has the capacity to rotate forward or in reverse, depending on which input signal is active.