0.0.1 Depth estimation unit

Web Cam

(LAPCARE LAPCAM)

Figure 1: Web cam

1. 1280 x 720 pixels @ 720p resolution
2. Automatic low light correction
3. Plug and play Linux compatible, High-Speed USB 2.0

0.0.2 Microprocessor

Microprocessor serves an important role in DAC application, data processing estimation and controlling the response hardware in real time.

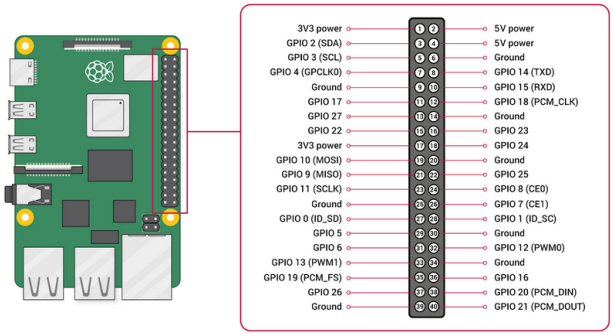

Figure 2: Microprocessor (Raspberry Pi 4B 4GB)

Raspberry Pi 4B 4GB RAM model comes packed with,

1. Quad core Cortex-A72 64-bit @ 1.5 GHz clock and uses ARM v8 architecture, with 4GB LPDDR4-3200 SDRAM.
2. 2.4 and 5 GHz IEEE 802.11ac wireless wifi hardware.
3. 2 Micro HDMI ports.
4. H.265 (4kp60 decode), H264 (1080p60 decode, 1080p30 encode).
5. OpenGL ES 3.0 graphics.
6. Micro-SD card slot for loading operating system and data storage.
7. 4 USB ports.
8. Software PWM on all pins and Hardware on GPIO12, GPIO13, GPIO18, GPIO19.
9. SPI
   - SPI0 : MOSI (GPIO10), MISO (GPIO09), SCLK (GPIO11), CE0 (GPIO08), CE1 (GPIO07)
   - SPI1 : MOSI (GPIO20), MISO (GPIO19), SCLK (GPIO21), CE0 (GPIO18), CE1 (GPIO17), CE2 (GPIO16).

0.0.3 Mechanical unit

Servo Motors

(SG90 Servo)

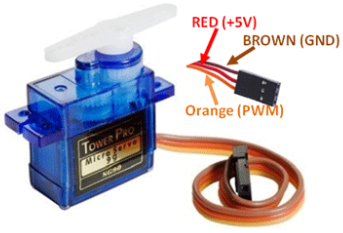

Figure 3: SG90 Servo

1. 180° rotation (90° in each direction).

2. Torque 2.5 kg-cm

3. Voltage 4.8-6 V

4. Speed 0.12 sec/60°

0.0.4 Audio processor unit

Audio Amplifier

(LM386N-1)

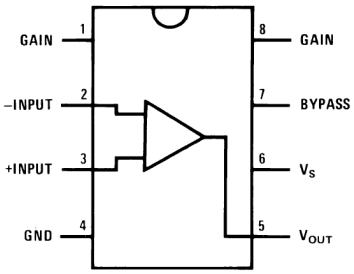

Figure 4: LM386N-1 pin-out

1. Operating Supply Voltage (Vs) 4 - 12 V

2. Voltage gain 20 - 200

3. Output power 325 mW

Digital Potentiometer

(MCP42010)

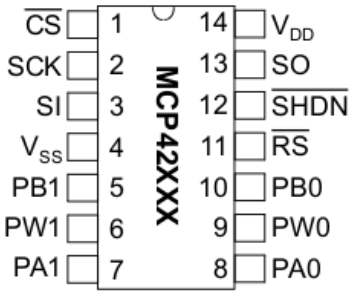

Figure 5: MCP42010 pin-out

1. Potentiometer values 10 kΩ

2. 256 taps for each potentiometer

3. 2 channel

4. SPI serial interface (mode 0, 0 and 1, 1)

5. Single power operation (2.7V - 5.5V)

6. Industrial temperature range: -40°C to +85°C

7. External temperature range: -40°C to +125°C

0.0.5 Speakers

The final component is the speakers, which are mounted on servos and the sound is dynamically controlled using Audio Processor. They have mounted on four corners of the room to form a four-channel audio system.

For this application, we are using 4Ω speakers to deliver four-channel output.