

Autonomous Person-Following Robot

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Outline

- ▶ Introduction
- ▶ Problem Statement
- ▶ Requirements & Specifications
- ▶ System Architecture
- ▶ Component Design
- ▶ Q&As

Introduction

- ▶ Autonomous robots have the capability of gaining information about the environment.
- ▶ They work without the need for human intervention for a long period of time.
- ▶ They can also adapt to changes in their surrounding environment.

Requirements

- ▶ The robot should be able to follow a specific person.
- ▶ It should be able to recognize the person from different directions.
- ▶ It should be able to recognize obstacles such as aisles, counters, and people and avoid them.

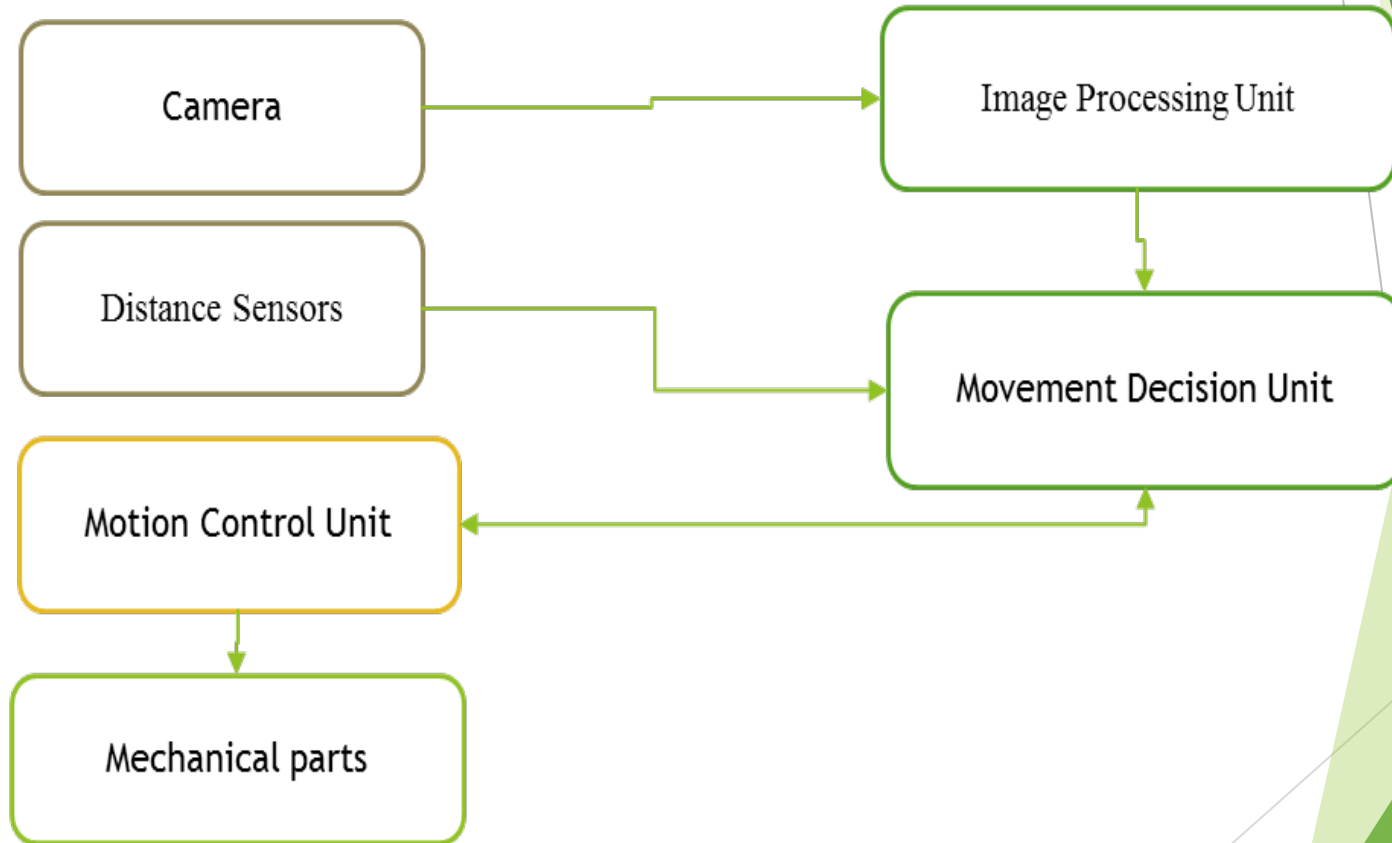
Specifications

- ▶ Identify subject to follow by camera.
- ▶ Following the identified subject
- ▶ Robot can carry up to 1 kg.
- ▶ 180 degree of view supported by servo motor move horizontally.
- ▶ 5 photo per second to catch subject movement.
- ▶ Keep distance of <2 meters to the followed person.

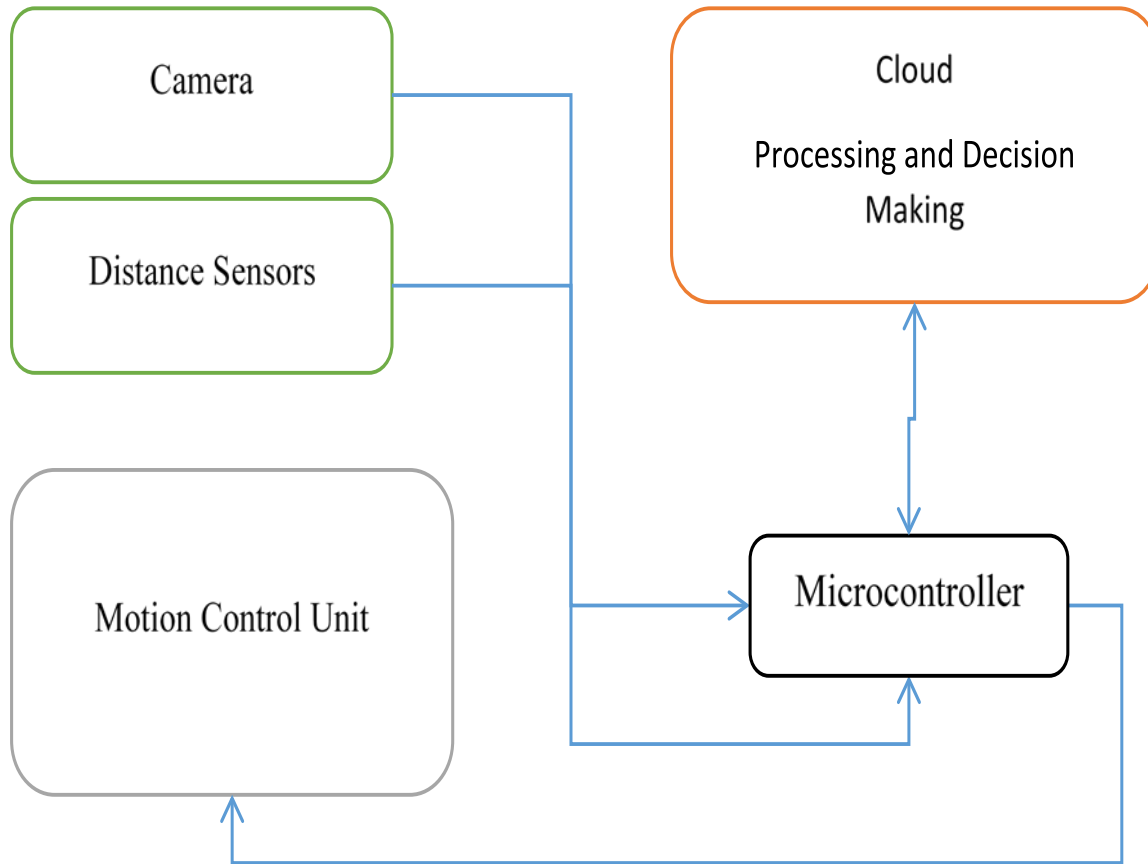
System Architecture

- ▶ Two different architectures

Architecture # 1



Architecture # 2



Comparison

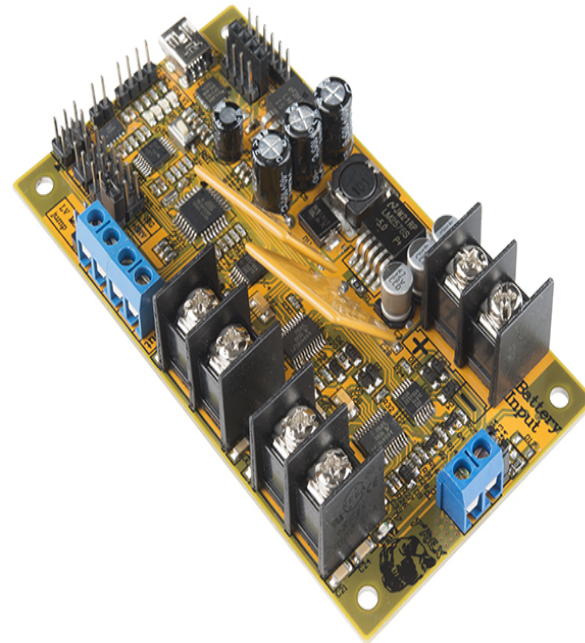
ARCHITECTURE/C RITERIA	PROCESSING TIME	POWER CONSUMPTION & BATTERY LIFE	LATENCY	ADDITIONAL COST
ARCHITECTURE 1 (WITH AN IMAGE PROCESSING UNIT)	5 frames/sec	Would last for 8 hours	Negligible	None
ARCHITECTURE 2 (WITH CLOUD)	5 frames/sec, 1 frame = 50 kb 250kb x 60 = 21 MB/min (and that's just to upload the image to the cloud, add to it the processing time of the image itself then the download time)	Since, it requires the device to be connected to the internet all the time. Would last for about 3 hours.	In best case milliseconds; dependent in the Cellular network	Cellular network ; 1 GB/month 79 riyals

Component Design



Motion Control Unit

- ▶ T'Rex Robot/Motor Controller



Robot Chassis

- ▶ DAGU 6-wheel-drive chassis



www.pololu.com

Distance Sensors

- ▶ Ultrasonic sensors



Servos

► Hitec HS-422



Bluetooth Module

- ▶ DAGU Bluetooth module

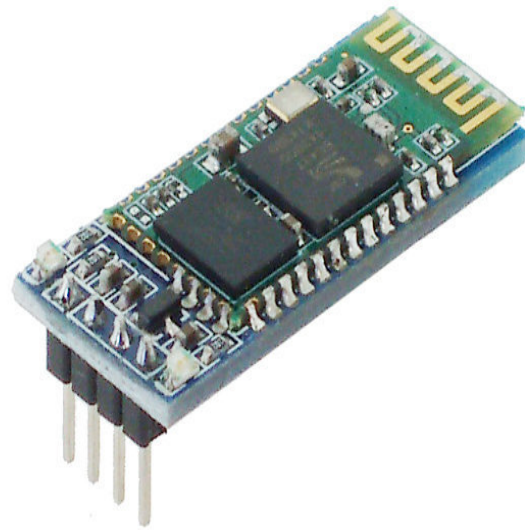
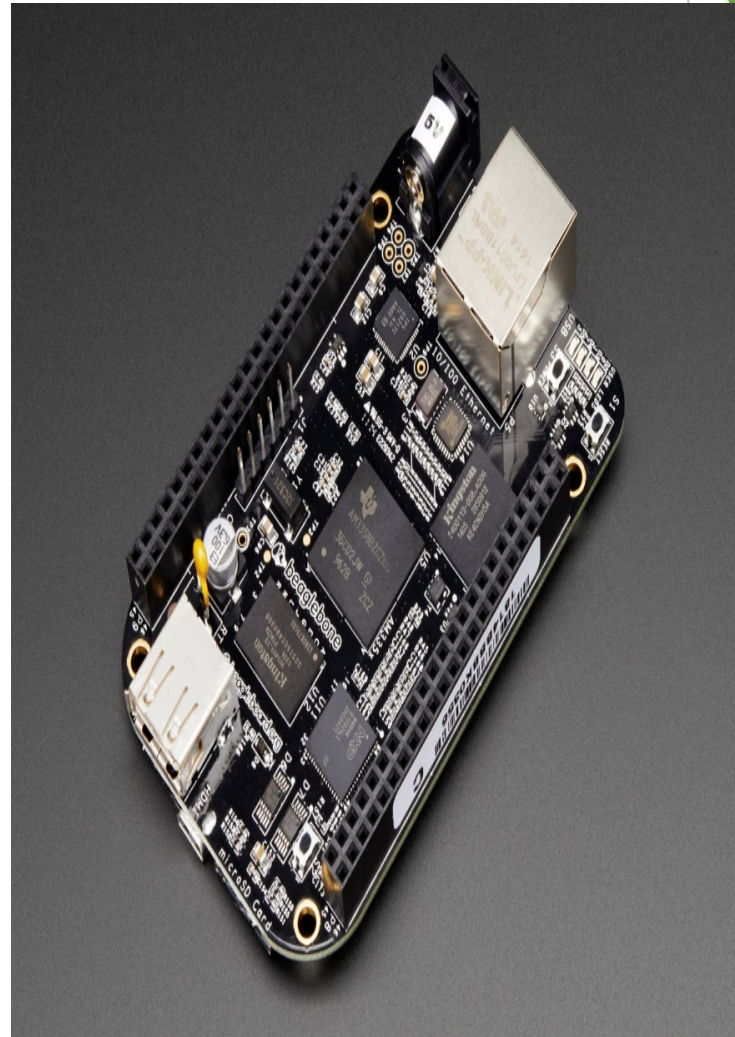


Image Processing and Movement Decision Unit



ANDROID



Comparison

	Criteria			
Option	CPU	RAM	Camera	Bluetooth
Beaglebone black	Dual-core 1.3GHz	512MB DDR3	Not built in	Not Built in
Android device	Dual-core 2.3GHz	2GB	8 MP	v4.1, A2DP, apt-X

Progress so far

- ▶ Got more familiar T'Rex Robot .
- ▶ Explored OpenCV for android ; made a basic face detection app.
- ▶ Hands 'on servo.

Questions

