Projects

WU, CHI-JU

Online Version with Hyper Link: http://sayter99.github.io/img/Projects.pdf

My Projects

3D Sensor & Calibration
C/C++/Git/OpenNI/OpenCV

1

Devised an extrinsic calibration algorithm for little-overlapping dual-camera systems

Human-robot Interaction
C/C++/Python/ROS

2

Developed an approach to allow robots to detect users' intention to interrupt a robot mid-execution based on visual and audio signals

SLaM
C/C++/ROS

3

Implemented EKF and bundle adjustment to process a SLaM dataset

Mobile Robot
C#/C/C++/Git/IMU/Motion

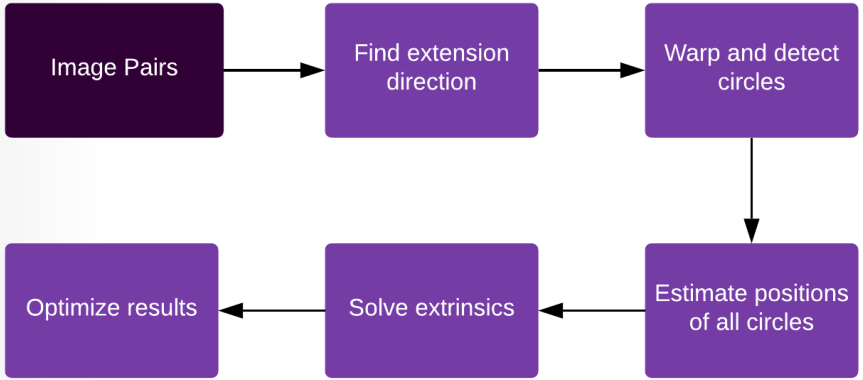
4

Implemented 86Duino Motion Editor, a robot motion editor can create motions and deploy them easily

Extrinsics Calibration

Extrinsics Calibration

Flow



Contribution

Successfully completed this project from scratch.

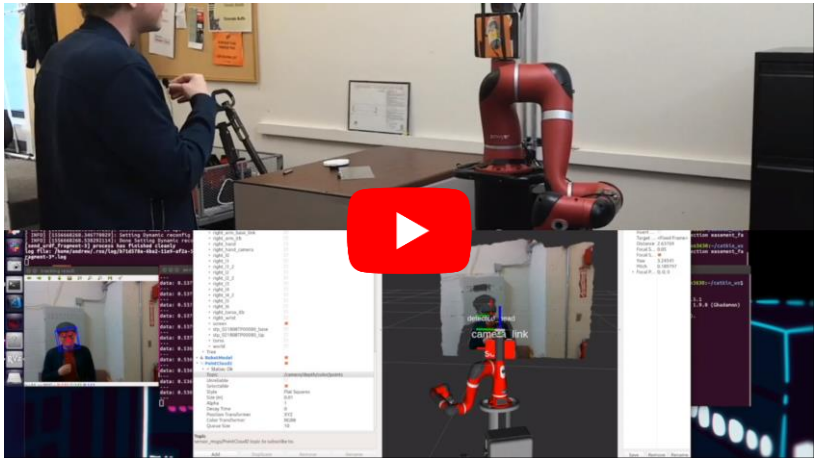
- Designed a calibration board that allows the program to detect extended direction
- Implemented the algorithm that is able to calibrate non-overlapping systems
- Optimized the accuracy by bundle adjustment
- Implemented the visualization program to evaluate the results

Human-robot Interaction

Interruption Detection

Interruption?

Because interruption is usually the onset of the communication, we decided to utilize both visual and audible cues to allow robots to detect users' interruption signals.



Contribution

- Implemented Dynamic Safety Margin controller on Sawyer based on MoveIt! and KDL
- Developed a system to detect the beginning of interruptions based on OpenFace
- Developed a semantic analyzer using Google Cloud speech-to-text API

SLaM Dataset Processing

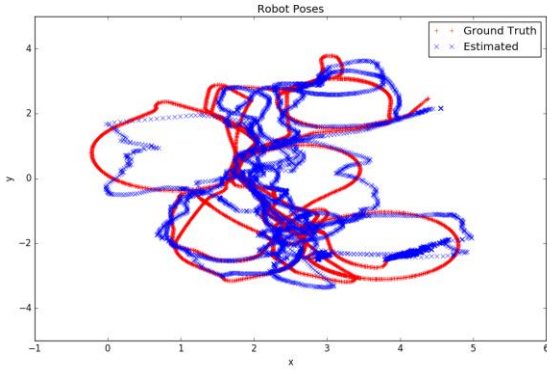
SLaM Dataset Processing

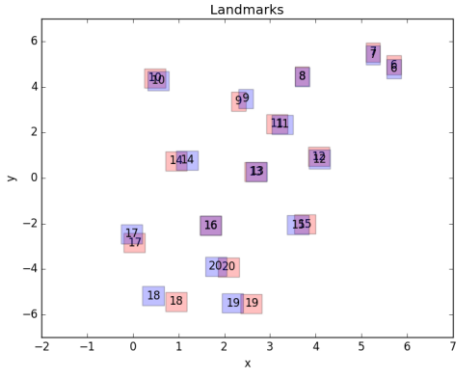
Dataset

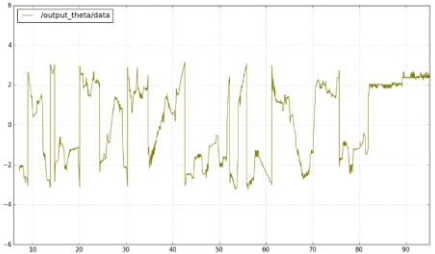
MRCLAM1 dataset: UTIAS Multi-Robot Cooperative Localization and Mapping Dataset (a.k.a. MRCLAM dataset) consists of 9 sets of data including odometry, distance and bearing measurements of 15 landmarks from 5 robots. The dataset originally aims cooperative localization and SLAM, but we utilize it for landmark-based localization from instantaneously available observation.

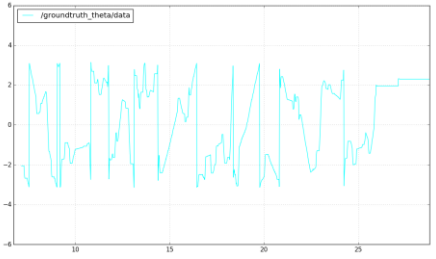
Method and Results

Implemented EKF as my SLaM front-end and bundle adjustment as my back-end.









86Duino Motion Editor

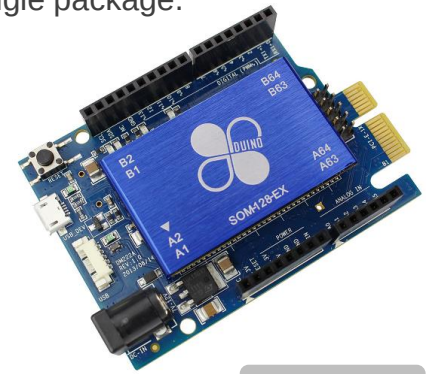
86ME, a robot motion editor for 86Duino.

86Duino Motion Editor

What is 86Duino?

The 86Duino boards are open-source embedded platforms employing the Vortex86EX SoC.

It integrates PCIE bus, DDR3, ROM controller, xISA, I2C, SPI, Motor/Motion Controller, IPC, Fast Ethernet, FIFO UART, USB2.0 and SD/SATA controller within a single package.



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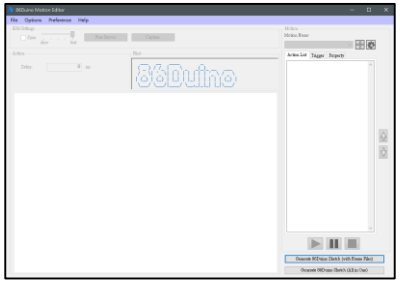
What is 86Duino Motion Editor?

86Duino Motion Editor, or 86ME, is a versatile desktop application for editing motions of robots which are manipulating by 86Duino.

Integrating with trajectory planning, on-board IMU sensor, logical control, and code generation functions, 86ME is absolutely a powerful motion editor.



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Robot Powered by 86ME

Humanoid Robot

This humanoid robot is a 3D-printable robot for demonstrating the functionality of 86ME.

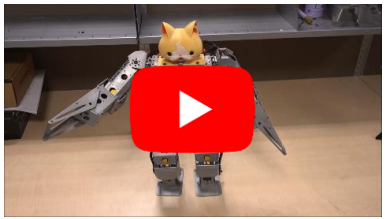
More Features

Trajectory Planning

Reduce vibration via interpolating motions by cubic splines

Logical Control

Basic statements for performing logical control are provided

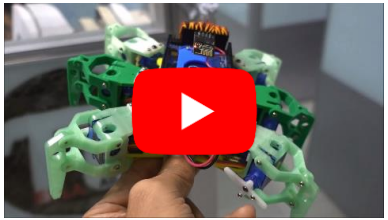


Multi-layered Motion Blending

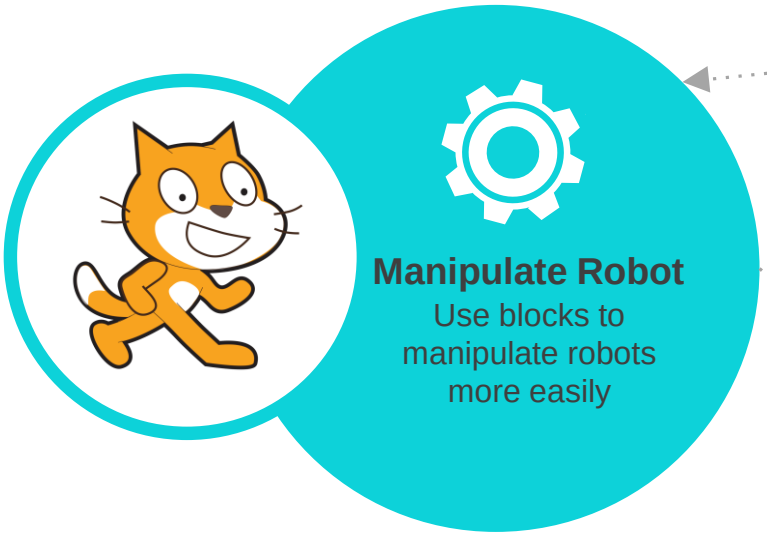
Perform motions in different layers to improve flexibility

IMU Integration

Integrate on-board IMU information to improve stability



86ME with Scratch 2.0

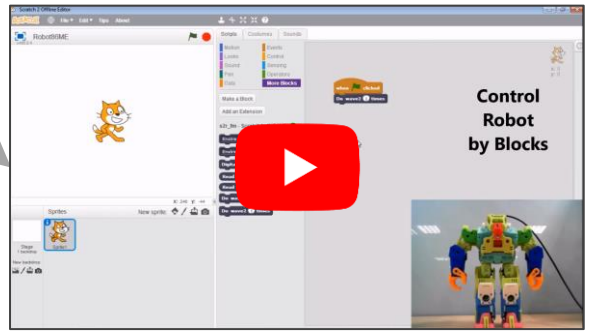


Manipulate Robot

Use blocks to manipulate robots more easily

Generate sb2, helper and corresponding firmware

86ME



86Duino SDK

86Duino Linux SDK

86Duino Linux SDK

Under L86duntu (based on Lubuntu 12.04), we can write programs with 86Duino Linux SDK (based on 86Duino Coding 210) to manipulate I/Os on 86Duino.

The user can include "Arduino.h" to call all 86Duino API (ex. digitalWrite) listed in the 86Duino Language Reference.

MRAA

Libmraa is a C/C++ library with bindings to javascript & python to interface with the I/Os on 86Duino.

This project is derived from intel-iot-Devkit.

Remote Control Car Using MRAA

AIServo86 Library

AIServo86 Library

Make easy the motion control of the robots consisting of AI servo motors. It is compatible to the original Servo library of Arduino/86Duino, and adds new advanced functions to control the velocity and action sequences of each servo.

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ROS Projects

Astra Camera

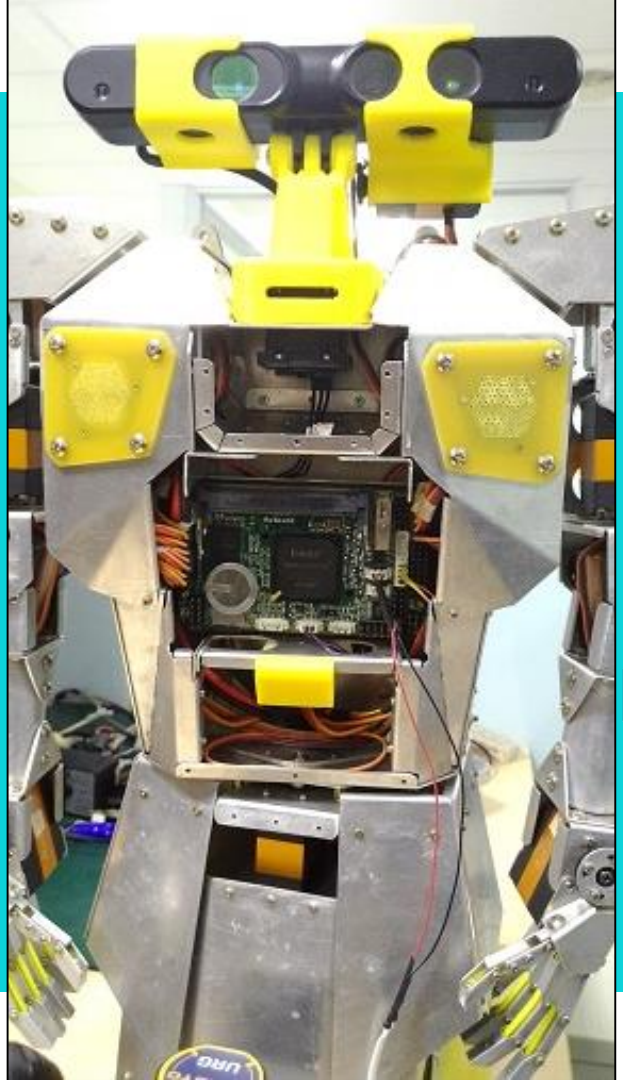
ROS Wrapper of Astra Cameras

Developed and maintained the ROS package to support all products.

Added useful services for all series of Astra cameras provided by Orbbec 3D including color-depth registration, ROSServices of setting exposure, gain, white balance, laser, LDP, etc.

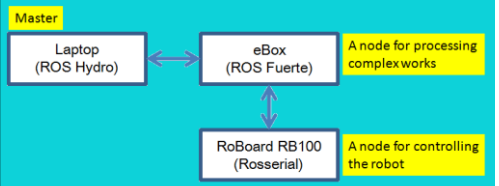
Robot Operating System

The Robot Operating System (ROS) is a set of software libraries and tools that help you build robot applications.



This robot was designed for exploring the ROS world.

Servo: AX12 and RS1270
3D sensor: Xtion PRO Live
Laser scanner: URG-04LX
Motor Controller: RB100
Computer: eBox



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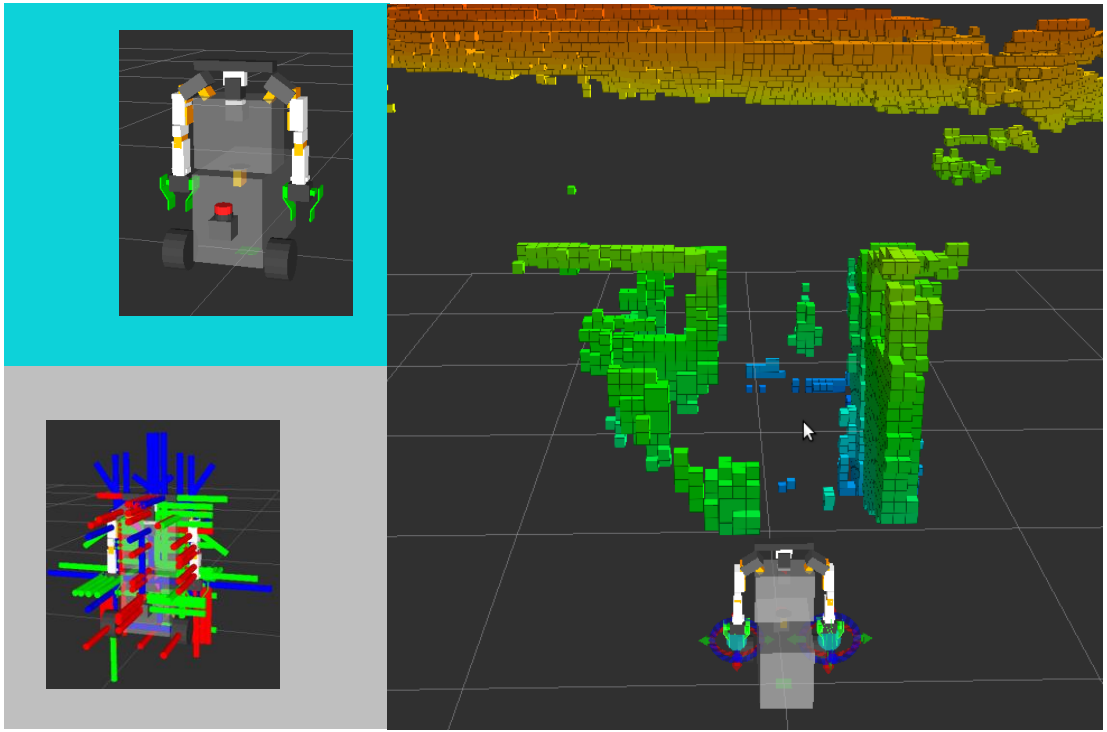
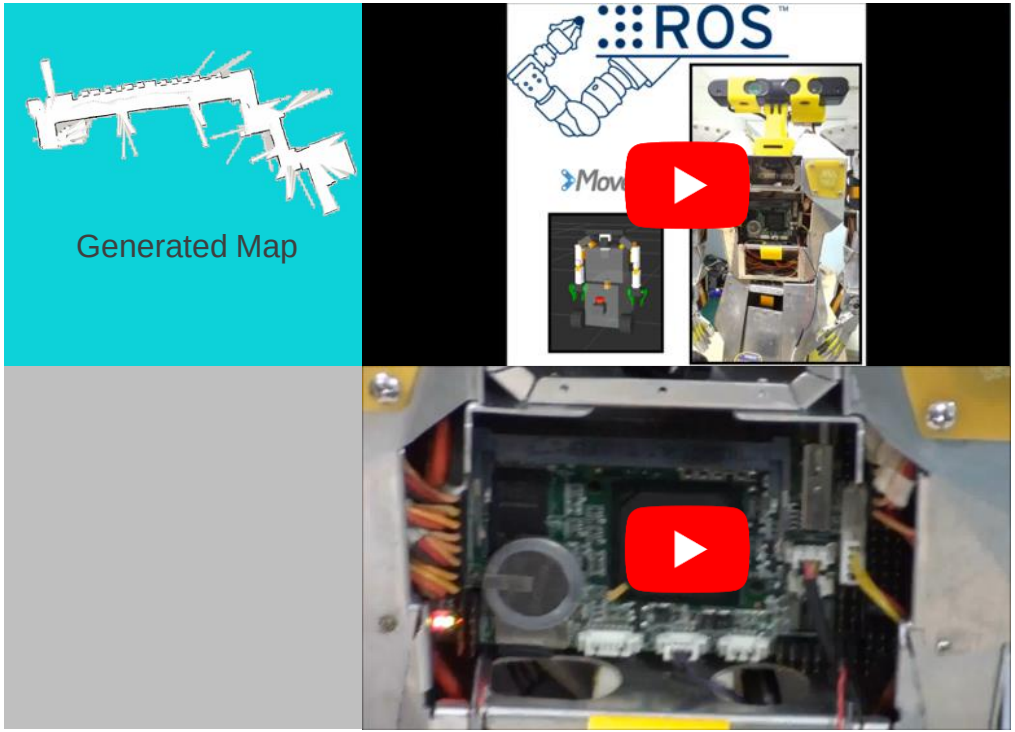
Demo



Build the model and add a sensor controller

Use the Xtion device to aquire 3D data for perceiving the surrounding environment. Accordingly, the robot can interact with the real world, such as avoiding obstacles.

Demo



SLaM

Simultaneous Localization and Mapping

In this example, the robot can generate a map by its laser scanner. The adopted package for mapping is Hector_mapping.

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Moveit

Motion Planning Framework

MoveIt! is state of the art software for mobile manipulation. This example shows that it can find out decent paths in different situation.

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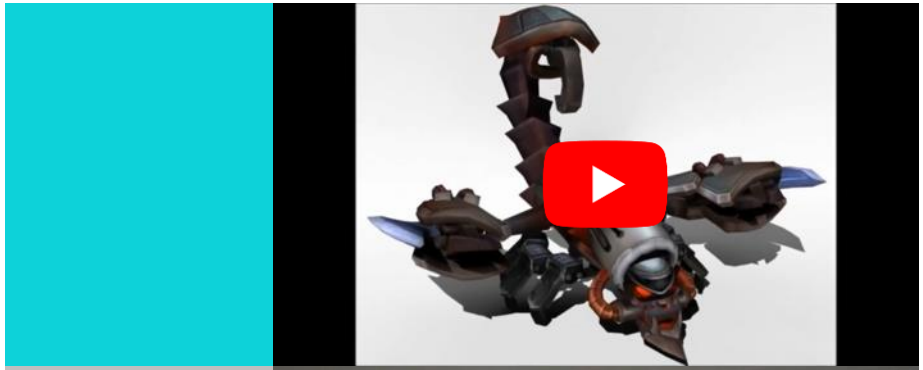
Demo



Swarm Robot

The robots are connected with each other by rosserial_86duino to perform “Monsters Exercise”.

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Voice Recognition

Through voice recognition package pocketsphinx, the hexapod can be manipulated by speaking specific instructions.

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Thank you

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