HEXAPOD
DESIGN AND BUILD

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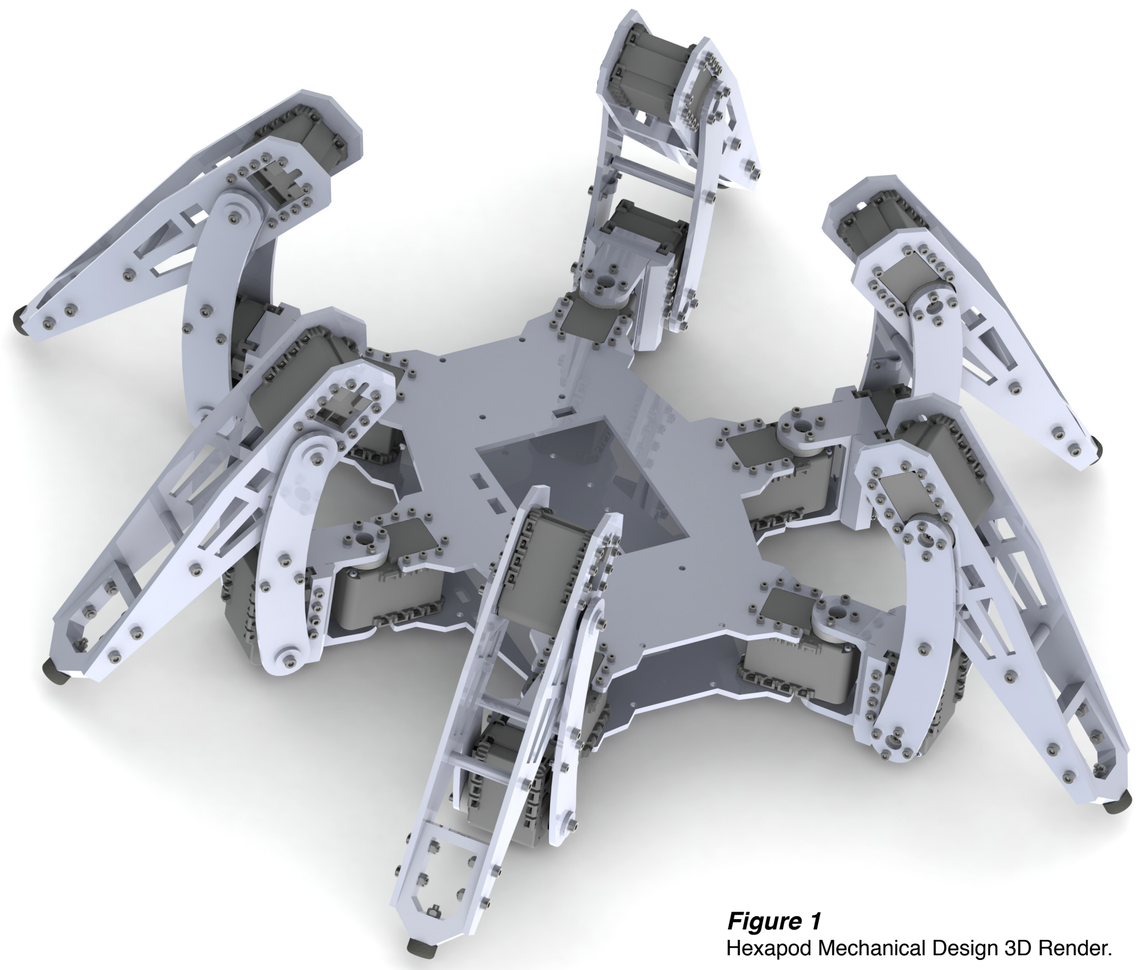

Figure 1
Hexapod Mechanical Design 3D Render.

Introduction

‘The field of robotics research has seen much development both in theory and in real-world applications in recent years’ (Chung & D. S. Perry, 1998). Nowadays electronic hardware rapidly becomes more powerful and compact, which allows building more sustainable and complex robotics platforms.

Recent developments resulted in appearance of fairly new Bio-inspired robots. ‘If we look inside these, we find that for the better part, they function very differently from biological creatures: they are built from metal and plastic, their “brains” are microprocessors, their “eyes” cameras, their “ears” microphones, and their “muscles” electrical motors that sit in the joints’ (Pfeifer, et al., 2012).

Aim

The Aim of this project is to design and build bio-inspired six-legged robot – Hexapod, with each leg having three degrees of freedom (3 DOF). Make it statically stable on three or more legs, allowing rest of the legs reach new destinations or manipulate a payload.

Objectives

- Project Proposal
- Mechanical Design & Build of a Leg
- Main Controller & Leg Board Prototype
- Software Design
- Main Controller & Leg Board Design and Production
- Mechanical Design of a body
- Full Assembly of a robot
- Poster Presentation
- Main Report

Methodology

The robot design can be divided into three subsystems: software, mechanics and electronics.

Electronic Circuitry Design

The Microchip 8-bit PIC18 Architecture Microcontrollers have been chosen as the controller units for Main & Leg Controller Boards. The communication between controller boards is implemented through CAN Bus. Power is distributed in a bus manner as well. The system will be controlled by external PC through Bluetooth communication protocol. All the circuits are produced in-house.

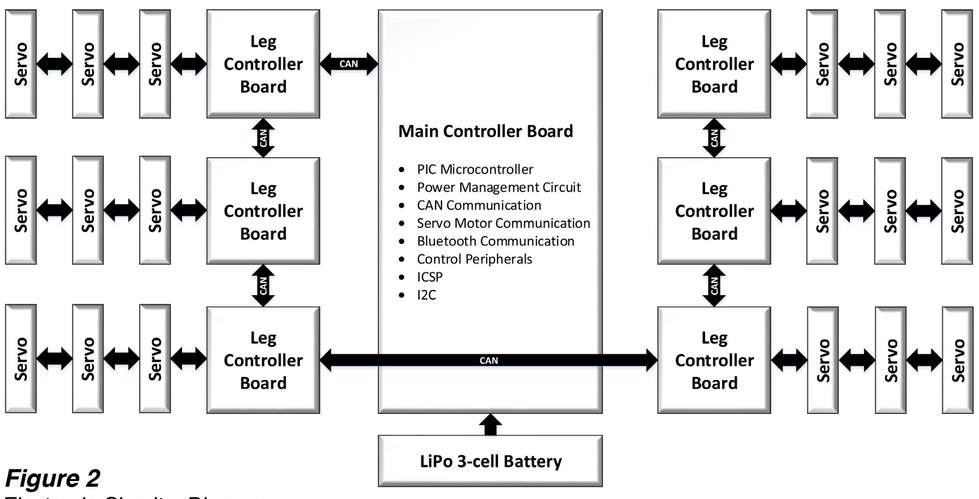

Figure 2
Electronic Circuitry Diagram.

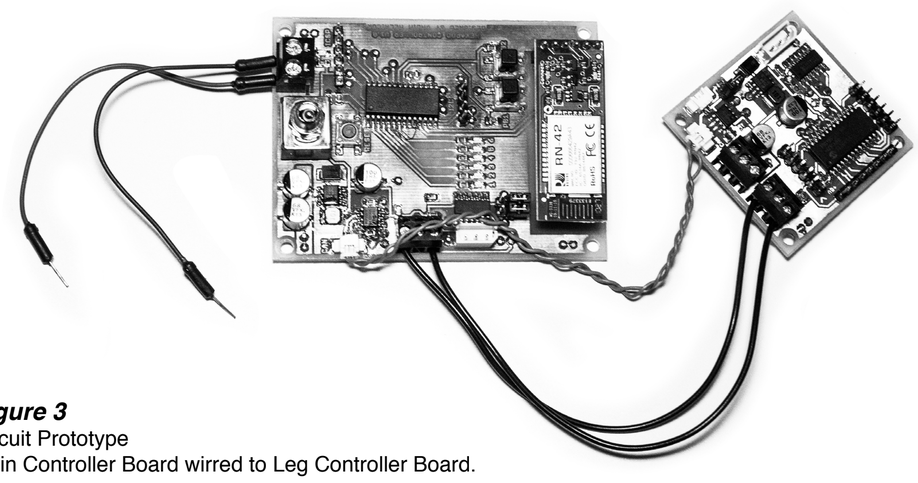

Figure 3
Circuit Prototype
Main Controller Board wirred to Leg Controller Board.

Mechanical Design

Each leg has three degrees of freedom, this provides smoother, less strict and more precise movements than two degrees of freedom can offer. It requires three Servo Motors to serve as active and passive joints, which are called: Coxa, Femur and Tibia. The design of all six legs will is identical; they are attached to the Hexapod’s base, which acts as a body and holds all electronics.

The the parts are produced in-house using laser cutting and 3D printing technologies.

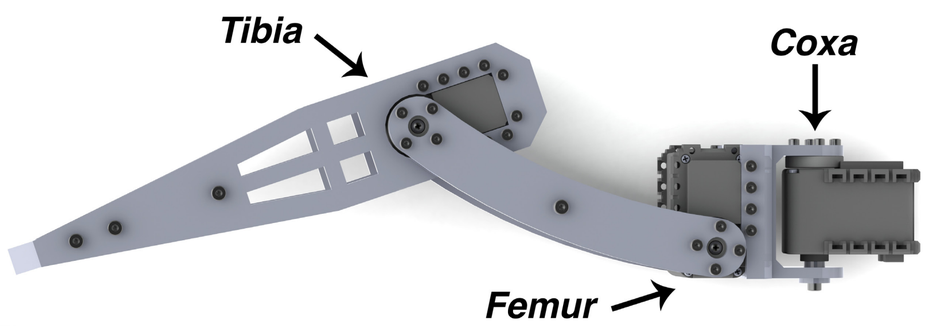

Figure 4
Leg Mechanical Design 3D Render.

Software Design

The software is written in C programming language. All the leg controller boards are programmed with an identical programs. Also, there is a separate program uploded to the main controller board. The Main Controller Board does receive commands from external PC through Bluetooth and passes related command sequences to the legs through CAN communication protocol.