

Ikimo: Open Entry-level Robotics Platform

Charith Fernando*
InMojo, Inc.

Jan Rod†
InMojo, Inc.

David Siren Eisner‡
InMojo, Inc.

Mauricio Cordero§
InMojo, Inc.

1 Introduction

Ikimo is a low-cost entry level robotics ecosystem build under Open Source Hardware license developed initially as part of research project in Keio University. The project was motivated by the lack of financially accessible robots on the market that would be able to support very wide scope of research projects, that vary in complexity and demands on the technology - including the needs for possible modifications both to software and hardware. Ikimo also functions as cheap robotics learning platform. It integrates physical designs, hardware and software and thus provides set of tools for various robotics applications, allowing modification based on users' demands, as everything is shared under open source licenses. Ikimo was devised as an alternative to other robotics system used in research projects, such as Roomba, that do not (or do only partially) allow the modifications based on the application needs.

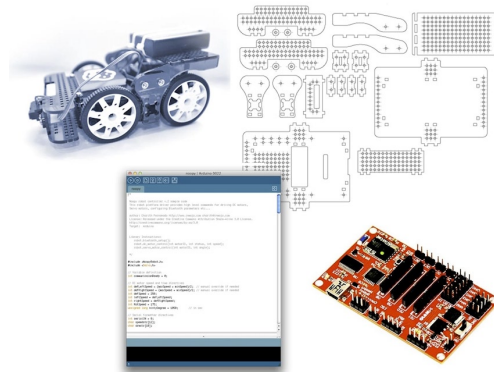


Figure 2: *Ikimo system and its parts.*

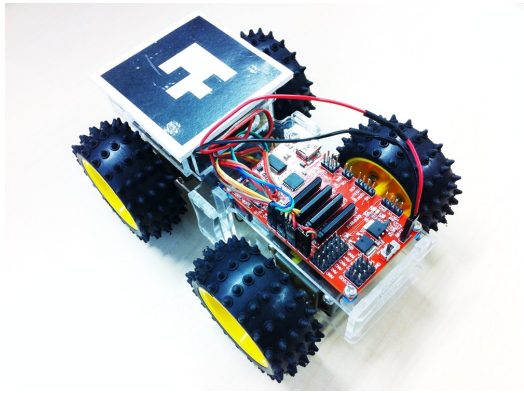


Figure 1: *Ikimo robot, buggy version.*

2 System Description

The Ikimo ecosystem composes of three main parts: the “brain”, a micro controller board that implements various functionality; the robot chassis, based around cheap accessible materials and laser-cutting friendly designs and finally software API that allows multiple levels of programming to meet various demands of target communities of researchers, educators and designers that are using Ikimo robots for their projects. The robot brain is based on Atmel 328P chip preloaded with Arduino stack. Using Arduino, rather than custom built software significantly simplifies the learning curve of the whole platform. Furthermore, the board contains four DC motor controllers, four servo motor outputs and six analog sensor breakouts. The communication is facilitated by Bluetooth using standard serial protocol. Boards can be stacked to allow access to more inputs and outputs, in which case they communicate over I2C protocol.

*e-mail: charith@inmojo.com

†e-mail: jan@inmojo.com

‡e-mail: dseisner@inmojo.com

§e-mail: mauricio@inmojo.com

Ikimo system has two types of software APIs. The first one, firmware API works on the system level of Arduino and allows experienced users of this platform to easily program the robots without a need for detailed knowledge of DC motors controls or readings of analog sensors. The firmware API allows to control directly single motors and read analog values of sensors providing great flexibility to configure various movement patterns including steering and rotating the robot. The higher level API provides access to simple set of commands that with which user can control the whole robot. These commands, sent to the robot wirelessly over Bluetooth, are optimized for going forwards, backwards, rotating by a given number of degrees and preprogrammed steering. This API simply allows anyone to interact with the robot without the knowledge of Arduino programming, using any other environment, such as Processing, Java or C++.

3 Demonstration Scenarios

We would like to demonstrate some semi-autonomous as well as autonomous operations of the robots, including: interfacing with video game controllers (Wiimote) with obstacle avoidance; AR-based applications, such as draw-a-path-to-follow, or a vector analysis based movement of objects applied in physical games based around moving blocks in space. The demo is focusing on demonstrating hands-on all the abilities and various configurations achievable with Ikimo robot platform. We also propose to do a workshop focused on building the robot from scratch and basic interaction with the robot.

4 Conclusion

Ikimo provides an interesting alternative to existing robotics platform. Due to the complete openness of the system in hardware design, physical design and software, it presents an ideal entry-level robotics platform for simple research projects as well as for teaching robotics in higher educational level institutions (from high schools to universities). Ikimo was a part of multiple research projects and publications and thus is tested in real applications.