

THE ICUB HUMANOID ROBOT  
PROPOSAL

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## **ABSTRACT**

The iCub is a humanoid robot developed at Istituto Italiano di Tecnologia (IIT) as part of the European Union project; RobotCub and later adopted by more than 20 laboratories around the world. Research team have developed a computer simulator to experiment new techniques without having a physical robot.[1]

## 1. INTRODUCTION

The iCub simulator is designed to be as accurate as real world psychics and dynamics. Construction based on directly from first prototype simulation environment Webots[2]. Webots is expensive and had limited access to source code which made hard to modify source code in order to add some properties. Then iCub simulation created. Simulation environment uses ODE(Open Dynamics Engine)[3] to simulate body movement and collision detection algorithms to measure psychical interaction with the world.ODE is used in wide range of projects like Gazebo project.[4]ODE is an open source physics engine for authoring tools, computer games,etc. It uses OpenGL renderer and it has some disadvantages due to limitation of OpenGL engine computation efficiency on complex structures.iCub simulation uses OpenGL directly via SDL which helps to render complex robot movements and computation efficient simulation observations.[5] Simulator is free and available to anyone who interested in robotics and learning about basics of robotics.

## 2. LITERATURE SURVEY

Development of simulator is described by abstraction of parts to handle complex instructions more precisely and efficient. Some other external software libraries are used to reduce required time to animate given parts of robots body from parameters. Abstractions made it easy to implement new methods, algorithms into a simulation environment. Understanding of these libraries are the key of creating new interfaces and methods to robot in virtual world.

Action primitives are pre-defined inside a simulation environment to extend capability of creating new interfaces to virtual simulation world and can be changed or taught as different languages which helps to extend knowledge about languages.

### 3. METHODOLOGY

Research will go on a computer simulation model of the iCub robot. The simulator allows to create realistic scenarios in where robot can interact with a virtual world and physical limitations and interactions that occur between the virtual world is simulated using open source library which is ODE (Open Dynamics Engine) to provide accurate simulation of body dynamics. The iCub simulation was developed on the

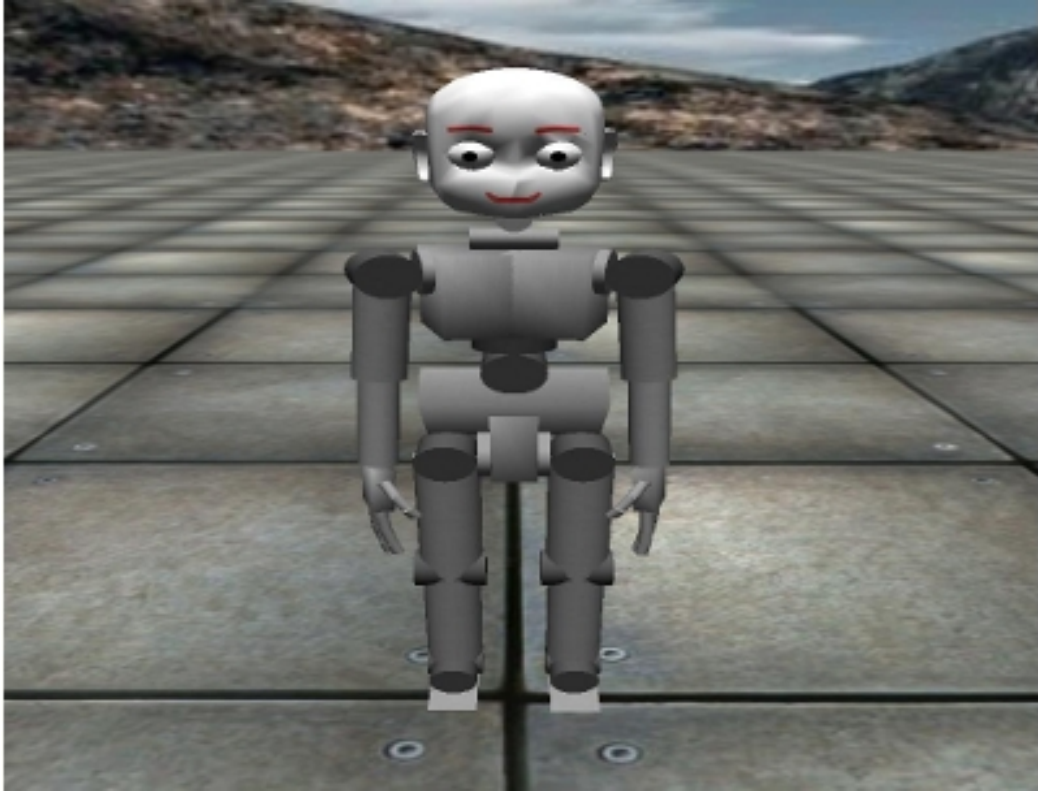


Figure 3.1. iCub on simulation

top of YARP(Yet Another Robot Platform)[?].YARP is a set of open source libraries that supports modularity by using abstraction method in softwares to handle common difficulties in robotics area which are know as modularity algorithms and hardware interfaces and OS platforms.To deal with OS spesific builds,requires to use cross-platform build tools such as CMake[7] and ACE[8].

YARP is providing platform independence. First abstraction can be described as a protocols.Main YARP protocol manages inter-process communications in operating systems. It can deliver process messages of any size across the network by using different protocols.

Second abstraction is about hardware communications. The method is to define interface for class of devices to fold native coded APIs. Changes in hardware requires changes in API calls via linking suitable libraries to encapsulate hardware dependency problems. These two abstraction combined to use remote device drives where that can be accessed across the network like a parallel processing.

```

Administrator: cmd.exe - yarpserver

c:\tmp>yarpserver

  YARP

Options can be set on command line or in C:\Users\nat\yarp\conf\yarpserver.conf
Port database: ports.db (change with "--portdb newports.db")
Subscription database: subs.db (change with "--subdb newsubs.db")
*** Make sure these database files are not on a shared file system ***
To clear the name server state, simply stop it, delete these files, and restart.

IP address: default (change with "--ip M.N.N.N")
Port number: 10000 (change with "--socket NNNNN")
yarp: Port /nat active at tcp://10.255.37.11:10000

Registering name server with itself:
* register "/nat" tcp "10.255.37.11" 10000
* set "/nat" ips "192.168.109.1" "192.168.150.1" "10.255.37.11" "127.0.0.1"
* set "/nat" process 7916
* register fallback mcast "224.2.1.1" 10001
* set fallback ips "192.168.109.1" "192.168.150.1" "10.255.37.11" "127.0.0.1"
* set fallback process 7916
Name server can be browsed at http://10.255.37.11:10000/
Ok. Ready!

```

Figure 3.2. yarpServer running on Windows x86

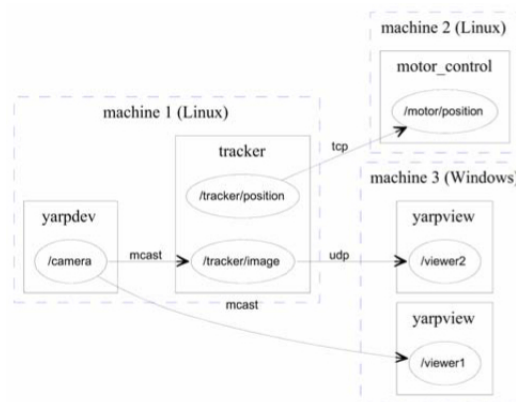


Figure 3.3. YARP Work Flow

The purpose of YARP ports are to move data from threads to threads over the processes. Flow of the data can be configured and observed from command-line at real-time. Port can receive or send data from any other port. Connections between ports can be modified easily with using different protocols such as TCP (Transmission Control Protocol) and UDP (User Datagram Protocol). The choice of protocol is depends on quality of message transmission or response time. Using TCP is for reliability and UDP is for speed with effect on unreliable transmissions.

## 4. CONCLUSION

The latest stable version of the simulator will be used to implement some action primitives into a default library to extend it's knowledge about different languages such as Turkish language. Compiling the UNIX source code of YARP and iCub may difficult due to some bugs and system environment variables. Using UNIX systems

## REFERENCES

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