

iCub - RobotCub Consortium

Overview and Purpose



The iCub robot is a small-size humanoid robot 5 years in the making, being designed by the RobotCub Consortium in Europe in collaboration with a number of European Universities and other partners worldwide. The robot's design was modeled off of a 3.5 year old human child, but when it was originally built robotic hands were not being engineered that size so instead of a 3.5 year old hand they replaced the design with the equivalent of 8 year olds' hands. The general purpose of iCub is to



Figure 1: Professor Darwin Caldwell with the first edition iCub robot



Figure 2: Playing electronic drum set.

create a robotic child in all meanings of the word. Meaning that iCub has the capability of copying or mimicking complex human actions and teaches itself to learn. In 2009 iCub learned how to play the drums, and the scientists behind it has been quoted saying "it will eventually be capable of mimicking many other human activities, such as walking, negotiating obstacles and sitting up" (1). The groups behind the iCub's creation made this project an open project in different ways to help encourage innovation and creativity while creating a sound design and implementation of both design and engineering. Since iCub is built and designed to act as if it were an actual child, meaning it initially doesn't know how to do certain things and the primary function is to learn new "skills" and "tasks" there are a number of things that iCub will not be able to do. It may be limited by both its size and also its "knowledge base". Currently iCub is not a walking model, but has the potential of being a walking model in the days to

come. The students at the Imperial College, London, are attempting to teach iCub to imitate human actions as to avoid software control which is often time consuming and complicated.

Actuators, Sensors and Specifications

The iCub's actuators operate i in 54 degrees of freedom:

- 7 for each arm
- 9 for each hand
- 6 for the head
- 3 for the torso and spine
- 6 for each leg (new and improved to provide extra support for the inevitable face plants that happen when a child, or a robot child, is trying to teach itself how to walk.)

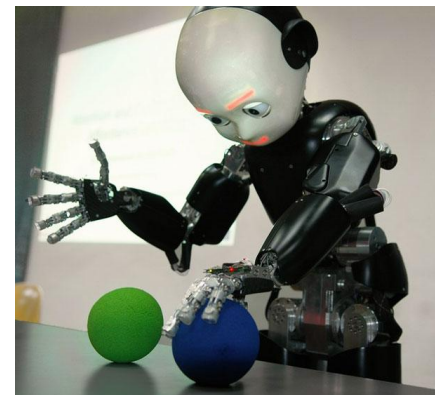


Figure 3: Object recognition and grasping.

The iCub uses the following sensors and hardware to accomplish its tasks:

- Stereo Camera (OCR technology/algorithms) used for object recognition and other basic visual processing primitives.
- Microphones (as ears, for speech recognition)
- Inertial Sensors used to detect falls and other changes in acceleration.
- Force / Torque Sensors (located in the upper arms and upper legs) though a unconventional placement used some extra computation to map the correct levels in joint torque control.
- Expression Control Boards (custom made control boards) used to control facial expressions.
- Magnetic Encoders used to measure distance traveled.

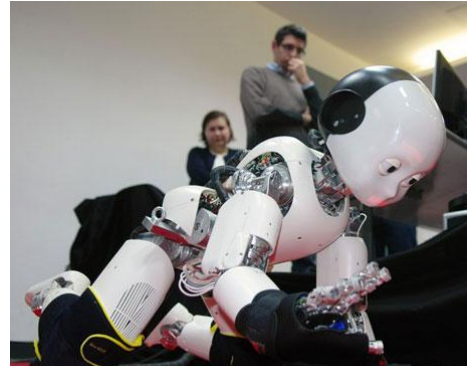


Figure 4: Learning to crawl before you walk.

References

1. [iCub Gets Younder, More Robust | BotJunkie](#) – written by Evan Ackerman posted by BotJunkie.
2. [iCub, Wikipedia the free encyclopedia](#) – written and post by the Wikipedia community.
3. [Make your own super-robot – Manchester Evening News](#) – written by Yakub Qureshi and posted by the Manchester Evening News.
4. [Manual – Wiki for RobotCub and Friends](#) – written by the RobotCub community.
5. [RobotCub – An Open Framework for Research in Embodied Cognition](#)
6. [iCub toddler Robot mimics what it sees \(literally\) – Gizmo Watch](#) – written by Vinod Shimla posted by Gizmo Watch