



Agency for  
Science, Technology  
and Research

## **MEDIA RELEASE**

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### **A\*STAR Unveils Singapore's First Social Robots at Robocup2010**

***Visit Suntec City to experience the first social robots - OLIVIA and LUCAS that can see, converse, breathe and enhance your lifestyle***

The Agency for Science, Technology and Research (A\*STAR) will be at Robocup2010 to debut OLIVIA and LUCAS, the first social robots to be unveiled in Singapore, from 20 to 25 June 2010 at Suntec City Level 4.

Developed under A\*STAR's Social Robotics Programme (ASoRo), the robots are results of the integration of research capabilities of the Institute for Infocomm Research (I<sup>2</sup>R), the Data Storage Institute (DSI) and the Singapore Institute of Manufacturing Technology (SIMTech). Collaborating in the areas of Robotic Sense, Robotic Intelligence and Mechatronics, the programme develops innovative and unique robotics technologies that will benefit both the industry and the community, targeted at various sectors including entertainment, education, security, healthcare, and home assistance.

A social robot is an autonomous robot that interacts and communicates with humans by following social behaviours and rules. The OLIVIA project aims to develop an experimental platform for social robot study. As one of the first in this area, this platform is equipped with state-of-the-art robotic enabling technologies, featuring robotic brain, attention-directed dialogue and human-robot interaction. It also demonstrates the latest speech recognition technologies, vision understanding and motion learning and control technologies. In this exhibition, OLIVIA displays its ability

of social interaction with human in performing daily tasks such as playing music, controlling electrical appliances and making calls.

Said Dr Li Haizhou, Programme Manager of A\*STAR's Social Robotics Programme: *"The OLIVIA and LUCAS robots are the outcomes of our social robotics research programme aimed at benefiting future generations of the modern world that will likely see robots as part of their environment."* He added: *"At A\*STAR, our approach in designing and developing technologies are not only influenced by strict technical performance criteria but motivated by social concerns, and we believe that our technologies will benefit the industry and end-users alike."*

### **About OLIVIA**

Some of the abilities OLIVIA possess include:

- **Facial Feature Detection and Tracking:** OLIVIA is able to detect lip motion, and to track human face and eyes for natural and robust human-robot interaction.
- **Attention-Directed Dialogue:** OLIVIA coordinates inputs from speech and vision to perform situational awareness for interaction in a human-robot dialogue.
- **3D Sound Localization:** OLIVIA is equipped with 8 strategically placed microphones to accurately locate the source of human speech in a 3-dimensional space.
- **Natural Robotic Gestures:** OLIVIA performs coordinated gestures by learning from human demonstrators.

Currently, OLIVIA recognises keywords and gives programmed responses. The next stage of development is for OLIVIA to understand and respond to natural human speech much like if you were speaking with your friend.

Moods such as sadness, happiness and excitement can also be programmed for OLIVIA to respond appropriately when detected in a conversation. OLIVIA's robotic vision and audition technologies will be implemented in a patrolling guard robot.

More detailed information about OLIVIA is attached in **Annex A**.

### **About LUCAS**

The LUCAS project aims to develop a platform for a service robot that is easy to configure and operate. The platform is equipped with I²R's award-winning technologies such as speech processing and vision understanding for natural human robot interaction.

LUCAS was designed to provide information to visitors (information kiosk), to carry drinks, to patrol, and for tele-presence and tele-operation. In this exhibition, LUCAS will demonstrate its capability to perform its tele-presence capability, where it can be potentially used for healthcare and education. LUCAS is also the first robot that can perform a breathing expression to convey the robot's affective state, which increases the richness of the human-robot interaction.

Making its premiere at Robocup 2010, this platform will be further developed to configure it as a butler, information kiosk or tele-presence; whereas video-screen, camera, microphone and a leaner design will make it useful in areas hazardous to people, for example infectious wards

More detailed information about OLIVIA is attached in **Annex B**.

For more on A\*STAR's Social Robotics Programme (ASoRo), visit [www.asoro.a-star.edu.sg](http://www.asoro.a-star.edu.sg)

All media representatives and photographers are cordially invited to visit I²R's booth at Robocup2010, from 20 to 25 June 2010 at Suntec City Hall 403.

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Annex A: Information about OLIVIA  
Annex B: Information about LUCAS

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### **About the Agency for Science, Technology and Research (A\*STAR)**

A\*STAR is the lead agency for fostering world-class scientific research and talent for a vibrant knowledge-based and innovation-driven Singapore. A\*STAR oversees 14 biomedical sciences, and physical sciences and engineering research institutes, and nine consortia & centres, which are located in Biopolis and Fusionopolis, as well as their immediate vicinity.

A\*STAR supports Singapore's key economic clusters by providing intellectual, human and industrial capital to its partners in industry. It also supports extramural research in the universities, hospitals, research centres, and with other local and international partners.

For more information on A\*STAR, please visit [www.a-star.edu.sg](http://www.a-star.edu.sg).

## **Annex A: Information on OLIVIA**

### **Visual**

- Stereoscopic cameras allow her to see 70 degrees wide. Head can also tilt to see taller or shorter objects
- Mono-camera zooms in on the speaker's face, letting OLIVIA determine whether a human is talking to her.

### **Audio**

- 8 microphones to detect the direction of a human's voice, allowing her to turn to the human.
- Speech recognition to understand what the human is saying in a vocabulary of 50,000 common English words
- Audio speaker for OLIVIA's voice, which can be programmed to sound young, older, child-like or respectful

### **Movement**

- Mobile base
- Laser sensor to detect obstacles in the distance
- Sonar sensors for closer obstacles. This is similar to how bats sense distances

### **Action**

- Arm with 6 **articulation points**, 3 in the shoulder, 1 at the elbow and 2 in the forearm. This allows OLIVIA to mimic almost all human arm movements
- Hand and fingers let OLIVIA grasp and carry objects

### **Mood**

- Light rings currently used to indicate OLIVIA's status through colour, whether idle or engaged with a human. In the future these may be used to indicate OLIVIA's mood
- Touch sensors at the sides of head for people to tickle or caress her

### **Dimensions**

- Measures 1.65m tall
- Weighs 164kg including mobile base

**Current use**

- Greet a visitor and answer general inquiries
- Take the visitor's information from visitor's namecard
- Take the host staff's information from the visitor using speech recognition
- Connect a host staff and a visitor via telephone
- Provide direction for visitors to navigate in office building
- Control electronic appliances by following voice commands

## Annex B: Information on LUCAS

- **Multimodal human-robot interaction:** LUCAS is equipped with cameras and far-talk microphones for understanding human gestures and voice commands.
  - **Autonomous Navigation:** LUCAS is empowered by an intelligent autonomous engine to navigate by itself from one location to another, with the help of ultrasonic transducer and laser sensors.
  - **Tele-presence:** LUCAS allows a person to perform video chat with another person remotely – a tele-presence robot.
  - **Unified Robotic Platform:** LUCAS features a configurable software system that controls its robotic behaviour using XML script, therefore, no programming is required.
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