

## Interface for Human-Robot Interaction

Principal Investigator: Professor Seet Gim Lee, Gerald

Email: [MGLSEET@ntu.edu.sg](mailto:MGLSEET@ntu.edu.sg)

Office: N3-02c-75

Tel: (65) 6790 5600 (Office)

### PROJECT DESCRIPTION:

Efficient industrial robot's detection, identification, tracking and programming by hand-pointing demonstration can be solved by integrating multiple sensory modalities such as haptic input, gesture input, laser pointing, range data, visual commendation, task simulation.

A novel multimodal single-handheld device incorporates 5 force-returning finger-displacement pedals inputs, a hand motion (gesture) IMU input, a laser pointer, a range-LIDAR. Monitoring is implemented via the see-through glasses integrated with the transparent 3D display, outlining laser projector, video camera and IMU. Such interaction comprises a Secured Multi-Modal Interface (SMMI).

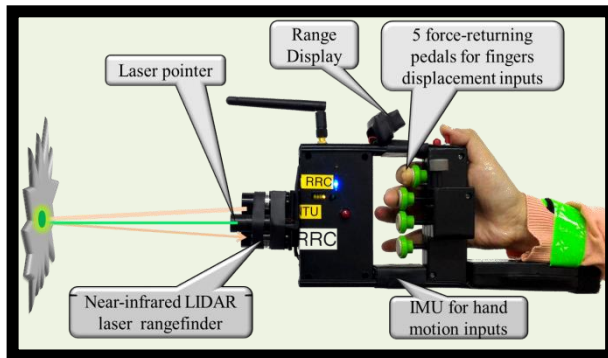


Figure 1: A novel multimodal single-handheld device

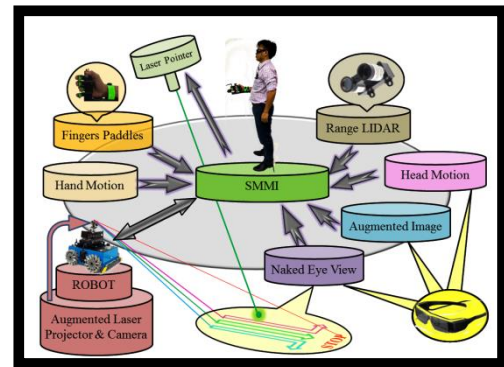


Figure 2: How a SMMI functions

The User selects the Robot and outlines a desired trajectory to the destination by hand using a laser pointer. Track of this “drawing” is captured by the camera of head-mounted display (or camera of the laser projector display) and is mixed with the area map stored in the same display. This technology is called programming by demonstration (PBD). Computer simulates a scenario of the task on the head-mounted display (or on the floor by laser) supporting it with written comments, which is AR – an augmented reality. When the user validates the simulated scenario, the task is being executed.

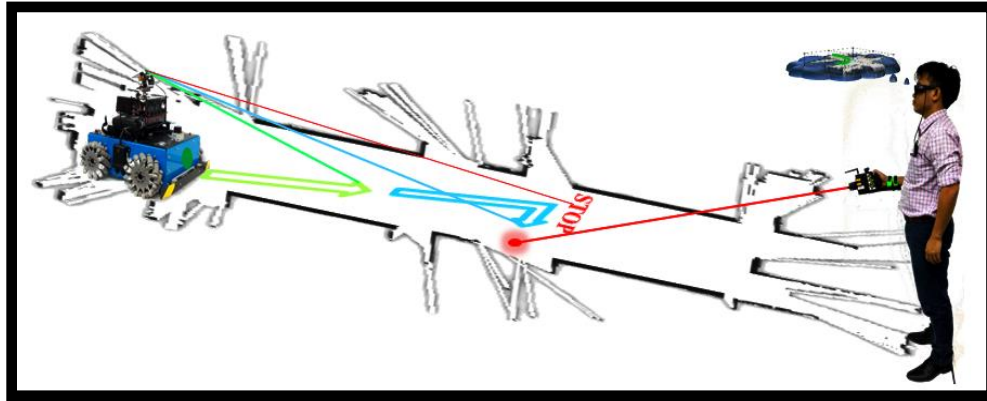


Figure 3: Demo scenario of SMMI prototype

Haptic & gesture controller possess its own **advantages** such as the ability of any fingers to do the work, the ability of each finger to sense its own button, finger feels that the work is being done due to a spring-return feedback and the redundancy of hand gestures.

**GRANT:**

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**PERSONNEL:**

Name	Title	E-mail
Prof Seet Gim Lee, Gerald	Associate Professor, School of Mechanical & Aerospace Engineering, NTU	<a href="mailto:MGLSEET@ntu.edu.sg">MGLSEET@ntu.edu.sg</a>
Dr Iastrebov Viatcheslav	Research Fellow	<a href="mailto:MViatcheslav@ntu.edu.sg">MViatcheslav@ntu.edu.sg</a>
Ms Pang Wee Ching	Research Associate	<a href="mailto:weeching@ntu.edu.sg">weeching@ntu.edu.sg</a>
Mr Dinh Quang Huy	PhD Student	<a href="mailto:DINH0009@e.ntu.edu.sg">DINH0009@e.ntu.edu.sg</a>

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