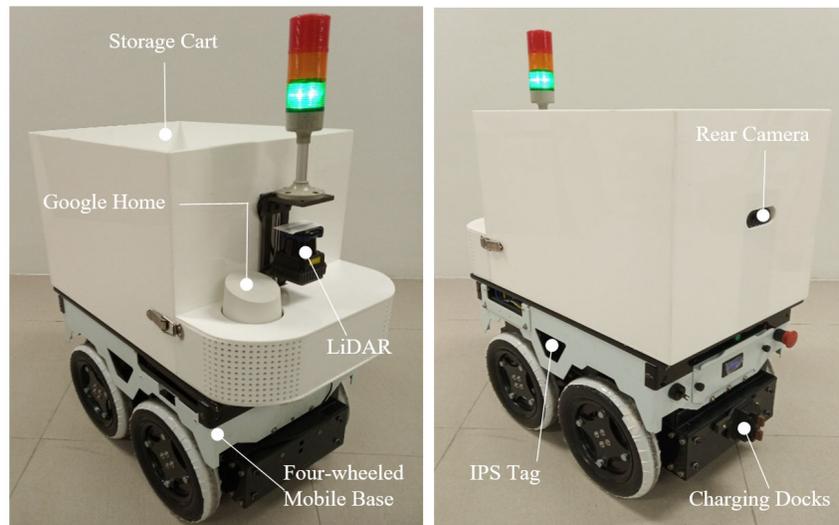# AI-enabled Follow-me Mobile Robotic Assistant (AIFO)

Technology Overview

Conventionally, it is common for guiding robots to rely on cameras, infrared technology and other vision related technologies to identify a subject, allowing a robot to be guided or to follow. Such technologies generally require line of sight with the subject or line of sight with an object attached, tagged or held by the subject. Problems such as loss of guiding capabilities arise when line of sight is lost.

The developed AIFO is a robotic mobile base designed as a smart shopping cart with a load bearing capacity of 50kg. It is capable of following or guiding human shopper to specific product within a mock-up grocery store.

The core technology offered by the Singapore academia is the software component that allows for mapping of fixed environments, route planning and correlation of the robotic base's real-time movement. The developed technology is meant for operation in indoor environments.

Technology Features & Specifications

The technology being offered can:

1. Conduct scanning of floor area, to enable the robot to map the environment and obstacle.

2. Correlate real-time movement of the robot with the pre-defined environment map, for its cognitive route/pathfinding software to map the path to its tagged user.

3. Utilise ultra-wideband (UWB) Indoor Position Tag to enable follow-me operation of mobile base. The tagged ID permits identification of a unique human and is able to track the user's location even if the robot has no line of sight of the user. This is useful in obstacle dense setup (e.g., grocery store with tall shelves).

4. Integrate chatbot style instruction for fulfilment of robotic services. The Dialogflow based chatbot allows capturing of conversation intents and is capable of translating human user inputs to provide guide-me or follow-me operation.

5. Operate for up to 3 to 4 hours of service time, with equivalent charging interval of 3+ hours. The cognitive software component of the robot can be programmed to accept conversational instructions for the robotic mobile base to return to its charging station for self-charging.

6. Customise for certain robotic behaviours (e.g., sound alert if distance between tagged human and robot hits a distance threshold, stops if encounter human obstacle).

Potential Applications

The technology can be applied for the following use-cases:

1. A Smart Shopping Cart comprising a load bearing mobile base that transports groceries while following shoppers.

2. A Robotic Concierge/Tour Guide that can lead visitors to locations within places of interest (i.e., museums, departments within a hospital, and other similar application use-cases), with capability to answer/react to visitors' queries.

3. An Intelligent Load Carrying platform that can assist in guiding a human co-worker and transporting loads within a warehouse by trailing its human co-worker.

4. A Medical Care Assistive Robot that can assist medical workers, people with disabilities, and/or patients.

Market Trends And Opportunities

As industries embrace both AI and robotic technologies, Human-Machine Collaborative (HMC) innovations have emerged as a promising area of development. The current pandemic situation discourages close contact interaction between humans. This give an unprecedented opportunity for adoption of human-robot collaborative operations, such as warehouse stock retrieval operations and robotic concierge services.

According to a Gartner report, the cooperation between humans and intelligent machines is forecasted to generate $2.9 trillion in business by 2021. HMC related innovations appear to have received a dramatic boost in the past five years. Given the growing emphasis on HMC across various industries, the growth of HMC innovations is expected to accelerate further, impacting our work and everyday life like never before.

The Singapore academic institute is open to opportunities in technology licensing or co-development projects which may lead to outcomes such as:

- creation of new products/services
- enhancing existing products/processes/services
- adopting or integration of the technology (software) in existing robotic hardware infrastructure or fleet control software platform

Customer Benefits

AIFO relieves labour resources when implemented as an intelligent load carrying platform for warehouse operation. As a robotic concierge or smart shopping cart, it can help to improve customers' experience by interaction through speech and guiding customers to desired locations.

Overview

- Technology Category   : Services & Digital Economy
                              Advanced Manufacturing & Engineering
- Technology Status   : Available
- Technology Readiness Level : TRL 6

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