Robotic Structuring of an Assistive Home: Experimental Test

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Introduction: This study aims to design an assistive living environment and implement a system capable of automatic localization, mapping, and dynamic evaluation. Agents with diverse capabilities can contribute information, fostering the creation of a collaborative map, thereby enabling distributed intelligence and multi-agent decision-making. The current project is specifically crafted for implementation in assisted living environments, catering to the needs of the elderly or individuals with disabilities. The robotic structuring seeks to establish an autonomous robotic system capable of adapting to various environments. This adaptability facilitates the incorporation of different information, whether conveyed through voice or activated by displaying a map through a User Interface (UI). This article's objective is to introduce the agents used in this system and illustrate how this structural framework enhances its application [1].

Materials and Methods: A mobile robot P3DX was employed for navigation within a laboratory setting, assisted by three AXIS PTZ 214 cameras, aimed at detecting both the robot and human subjects. Initially, human agents were represented by objects equipped with ArUco tags strategically placed throughout the space. All operations were managed through a dedicated REST server responsible for storing crucial map data. The conducted test focused on accurately identifying the position of human agents and guiding the robot in response to their requests, primarily initiated through voice commands. The map stored in the REST server is seamlessly integrated into a CoppeliaSim simulation, offering additional utility as a Human-Machine Interface (HMI). he command is communicated in natural language to the Large Language Model (LLM), which then translates it into action planning.

Results: The experimental test involved validating the system's ability to coordinate map coordinates and information derived from both the cameras and the robot. This information is gathered, organized, and made accessible for consultation by the Large Language Model (LLM) to facilitate action planning. In the preliminary phase, the sole action considered is movement. For instance, with the command 'Take me to person 1,' the robot, after consulting the map, discerns that person 1 is located in the laboratory, specifically in the corridor. Consequently, the system generates an action plan directing the robot to navigate to the laboratory, effectively executing the assigned task.

Discussion/Conclusion: As an initial step in this project, the system successfully executed tasks by collating information from diverse sources. It demonstrated real-time updates, establishing a platform that facilitates seamless translation from the Large Language Model (LLM) to machine language. n the subsequent phases, the system will advance to include automatic detection of human agents and objects. Additionally, it will incorporate a probabilistic fusion method for information, aiming to enhance autonomy and efficiency. This capability, in turn, simplifies the implementation of various User Interface (UI) interfaces

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