

## INERTIAL MOTION CAPTURE BASED TELEOPERATION OF A MOBILE ROBOT MANIPULATOR WITH A MULTIGRASP HAND

Y. Khassanov, N. Imanberdiyev, I. Tursynbek, H. A. Varol\*

School of Science and Technology, Nazarbayev University, Astana, Kazakhstan; \*ahvarol@nu.edu.kz

**Introduction.** Autonomous mobile robots are still not reliable enough for performing complex tasks such as search and rescue, space or undersea exploration and explosive ordnance disposal. Human intelligence is frequently employed for high-level robot decision making and control. Moreover, for most of the cases low-weight and dexterous end-effectors are required for performing delicate tasks efficiently.

**Materials and Methods.** In this work, a full-body inertial human motion capture system Xsens MVN was used to control the Kuka youBot mobile manipulator. Xsens MVN consists of 17 inertial motion trackers attached to the body using straps capable of providing real-time full body kinematic data. The KUKA youBot is an omnidirectional mobile platform with mecanum wheels, which accommodates a five degrees of freedom robot manipulator arm. Additionally, manipulator arm is complemented with the Nazarbayev University Multigrasp Hand for increasing efficacy of performing object manipulation tasks. The multigrasp robot hand is wirelessly controlled by cyber glove. In order to create an intuitive mapping between the body segments and mobile manipulator parts, we decided to use the left hand position and orientation to generate the robot end effector position and orientation references.

**Results and Discussion.** Extensive real-world experiments were conducted to test the performance of teleoperation using the developed system. Specifically, experiments shows that addition of the multigrasp hand and intuitive user interface for it decreases time needed for pick and place tasks up to 50 percent compared to the native open and close gripper of the KUKA youBot mobile manipulator.

**Conclusions.** Our preliminary work on the mobile manipulator teleoperation showed that inertial motion capture based signals complemented with gesture recognition provide a high fidelity user interface. Moreover, use of multigrasp hands as end-effectors is a promising approach to increase teleoperation performance of these systems.

**Acknowledgements.** This project is carried under funding of Ministry of Education and Science of the RK and the World Bank.



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