

3GPP SA1#105

Feb 26th – Mar 1st, 2024

S1-240243



Study on Network of Service Robots with Ambient Intelligence – Phase 2

Ki-Dong Lee

(kidong (dot) lee@ lge (dot) com)

LG Electronics

R19 Study

Anticipated roles of mobile / wireless communications in bolstering operational models of a group of service robots, with a particular focus on two primary collaboration modes within a group operation framework

- A. **In-Coverage:** fully collaborative (operation available at the max level of info available)
- B. **Out-of-Coverage:** competitive (operation available but at each local max level)
- c. Limited Coverage (or Partial Coverage)



Use Cases

- (5.1) Constructing 3D Maps
- (5.2) Strengthening Security
- (5.3) Intelligent Data Fusion
- (5.4) Visual Sensors in Service Robots
- (5.5) Robots in Care Communities
- (5.6) Voicebots for Accessibility
- (5.7) Geo-surface Sensing and Computing
- (5.8) Mining Robotics

Areas Driven by New Goals

There are certain areas that can still create value for telecom industry by more carefully architecting and designing next generation communications systems that can support operations of local and remote physical systems with or without human in the loop (autonomous system or semi-autonomous system with communication supported)

Examples in Some Foundational Areas of Use Cases

1. Living: smart assisted-living, traveling, shopping
2. Experience: robotic-assisted entertainment
3. Critical Roles: smart agriculture, public safety, disaster relief
4. Societal Goals: safety measure for workers in extreme conditions

To conduct further research

1. to thoroughly examine the support provided by the 3GPP 5G and/or by next-generation systems for groups of service robots across various usage scenarios

Everyday Living



Experience



Critical Roles



Societal Goals

The Objectives

(a) to further evaluate the outcome of Release 19 Study and (b) to identify use cases and aspects related to efficient communications service and cooperative operation for a group of service robots in various areas and industry verticals which are not covered previously, including

Examples in Some Foundational Areas of Use Cases

1. collaborative robots (cobots): cooperative networking among cobots (as a UE, a UE relay (main focus); mobile base station relay, and base station that are studied in other study/work)
2. efficient communication support for delivery robots sharing public roads with vehicles and pedestrians
3. efficient communication support for sensor fusion using multiple robotic applications
4. efficient communication support for wide-area sensing (e.g., monitoring farmland, wildlife using aerial robotic applications using UAVs) with intelligence across different communication entities
5. support of scalable and efficient use of communication resources needed for stable operation of multiple service robots especially when a large number of service robots are present

Appendix – Use Cases on Collaborative Group Operations (High Level Description)

Collaborative Group Operation

□ Uu / PC5:

- Multiple path management: Handover, path selection/re-selection, multiple paths per session
- KPIs and non-quantitative measures for goals

□ Delivery use cases (autonomous maneuver)

- Indoor delivery
- Local outdoor delivery (more challenging) – the condition of pathway surface is different than general road surface used by ground motor vehicles
- Related technology: surface sensing, object detection, record sharing (e.g., via DLT), communication path reconfiguration (Cooperation among SOBOTs)

□ Group Disinfection (autonomous maneuver)

- Related technology: mostly similar to technology required for “delivery use cases”;
- What’s different? What evolutionary aspect are needed? E.g., “cow” (as workforce in the history of farming)

□ Other use cases

- Communication Support of Personalized User Experiences
- Externally with: MEC, ext'l Applications
- Internally with li.e., within UE): Application (combined on-device Ambl modules)



Collaborative Group Operation

❑ Distributed network & Distributed computing

- Dynamic creation and update of SOBOT subnetwork
- Massive interactions among AI modules inside a SOBOT
- Cooperation among SOBOTs

❑ Automatic & autonomic network

- Real-time network configuration (update) to support adaptive interaction between SOBOTs and between SOBOT and human.

❑ Network supporting flexible service/application creation

- Framework to provide easily the new SOBOT service creation (for both service providers and developers)

❑ Enhanced connectivity and coverage extension

- Sobot Service availability, reliability

