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Technical Seminar on

Requirement and Architecture Design of Human Computer Interaction System for Manned Spacecraft Based on Deep Space Exploration Mission

By

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CSE

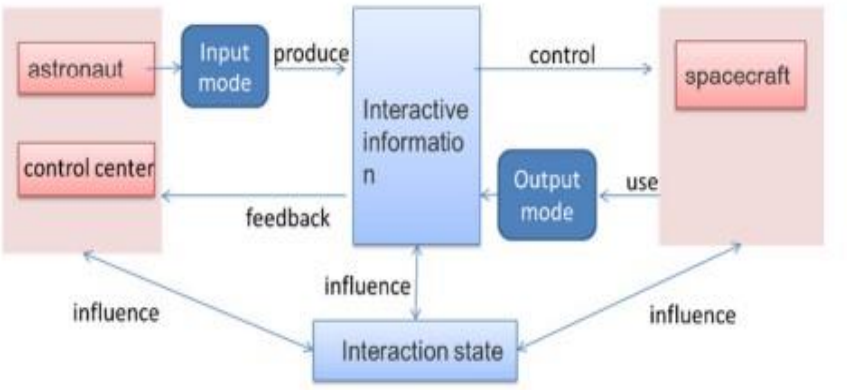
Presentation Outline

- Introduction
- Requirements
- Development Trends
- Architecture
- Advantages and Disadvantages
- Applications
- Conclusion
- References

INTRODUCTION

- Human computer interaction system is one of the most important system in manned spacecrafts.
- Human computer interaction systems is the manned spacecraft can be defined as the form in which astronauts use input and output devices to transfer information and energy with spacecrafts to complete a certain task.
- Characteristics of human-computer interaction system include :
  - Layered Design concept
  - Distributed information system architecture
  - Time division display mode
  - Multimedia technology in the auxiliary

HUMAN COMPUTER INTERACTION SYSTEM



Human Computer Interaction System Requirements

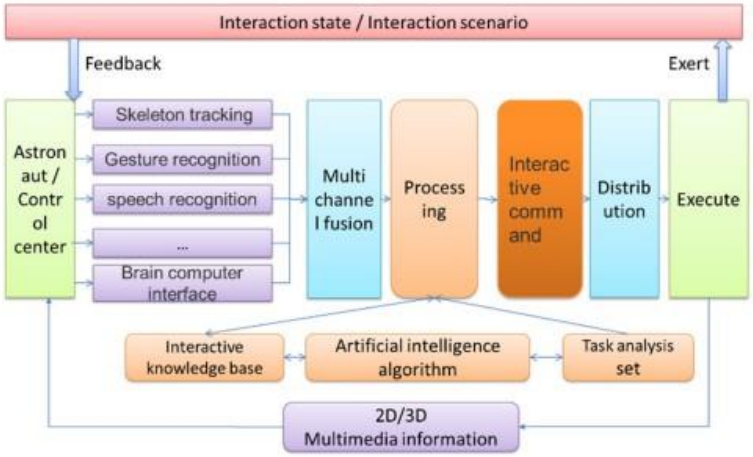
The Requirements of human computer interaction system can be divided into 3 levels:

- **First Level (Basic Functional Requirements)**: Ensuring the safety of spacecraft and the life safety of astronauts in orbit. Mainly includes monitoring & perception of spacecraft and human's own state.
- **Second Level (Task Requirements)**: Ensures the stable operation of spacecraft and support the astronauts to complete the short-term mission of deep space exploration. It includes monitoring & sensing of spacecraft external environments, docking, etc.
- **Third Level (Application Service Requirements)**: The functions involved in astronauts long-term stay on the planetary surface, including autonomous fault location and repair, collaborative sensing, etc.

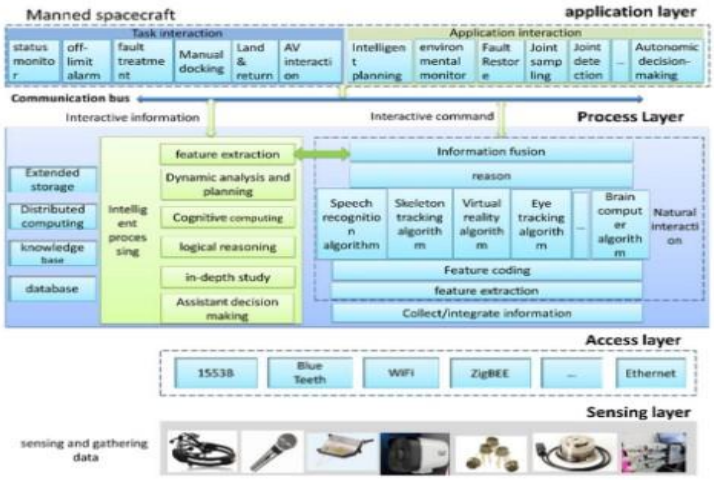
Development Trend

- **From Graphical interface to spontaneous interaction :**
  - The interaction between the astronauts and the spacecraft should be spontaneous and this can be done by including modules that will sense the human senses, expression and other human features and process this data to provide a 3D and continuous interaction with the astronauts.
- **From Single Channel and mode to Multichannel :**
  - The system collects information from the surrounding and the spacecraft with the support of big data, internet of things and cloud computing technology. This information is then computed and then the result is passed to the astronauts and the control centre.
- **From man machine cooperation to man machine intelligence fuse :**
  - The spacecraft can me made intelligent by the use of robot and machine learning modules, which will sense the astronaut and the surroundings to warn or interact with the astronaut as and when required to achieve situational awareness.

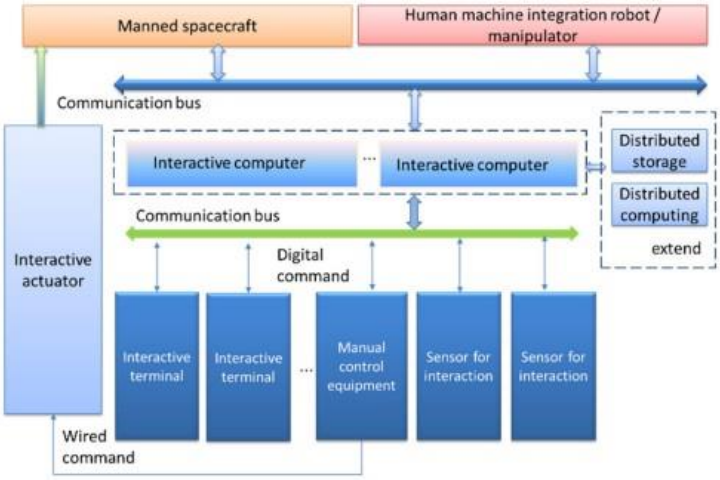
Conceptual Model



Architecture Design



System Components



Advantages

The advantages are enormous taking the future space exploration missions taken into consideration :

- Safety
- Human Computer coordination
- Assists astronauts in performing tasks
- Longer and wider planetary operations
- Efficiency

Disadvantages

The Disadvantages of this system are :

- Not always reliable
- There are possibilities failure
- Error in sensor reading can misdirect the spacecraft and astronaut
- Less margin for error

Application

- Space Exploration
- Deep Space Exploration
- Manned Space Missions
- Planetary Exploration

Conclusion

- The human computer interaction system of manned spacecraft based on deep space exploration is an indispensable part of the future spacecraft.
- It can ensure the safety of astronauts, assist astronauts to complete planetary surface operation tasks more efficiently and carry out planetary surface operations for a longer and wider area.
- It will help in the discovery of many unknowns that are still a question mark when it comes to space and the objects beyond a certain distance in space.

Reference

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