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DEVELOPMENT AND RESEARCH OF A COMPUTER GESTURE CONTROL SYSTEM

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Gesture control systems represent a promising direction in developing alternative methods for interacting with computer devices. They enable contactless control, which offers broad application possibilities, particularly in environments where traditional control methods are inconvenient or inaccessible. This work explores a conceptual model of a system designed for gesture recognition and interpretation to control a computer. The main objectives are to establish the core system architecture and to define the methods that will be used for gesture recognition.



Figure 1 – Simple Model of Gesture Information Processing

The design of a gesture control system includes the following key stages:

1. **Hardware Selection:** Determining sensors and cameras for capturing gesture information, such as RGB or depth cameras.
2. **Data Preprocessing:** Planning to use image processing methods to extract gesture features, including contours and key points.
3. **Gesture Recognition:** Considering algorithms for gesture recognition using machine learning techniques, such as neural networks, to enable efficient data processing and recognition of standard gestures.
4. **Gesture-to-Command Interpretation:** Translating recognized gestures into commands for computer control by integrating with application software, ensuring a logical mapping between gestures and actions.

During the design stage, the structure of the gesture control system is planned as follows:

1. **Sensor Module:** Captures gestures using a camera capable of recognizing hand and finger movements.
2. **Preprocessing Module:** Prepares images for further recognition, including noise filtering and key feature extraction.

3. **Gesture Recognition Module:** Implements algorithms to identify gestures that correspond to predefined commands.
4. **Control Module:** Interprets gestures as commands for computer control through an interface. As an example of the system's operation with this structure, a diagram was created to demonstrate the algorithm for gesture recognition and interpretation.

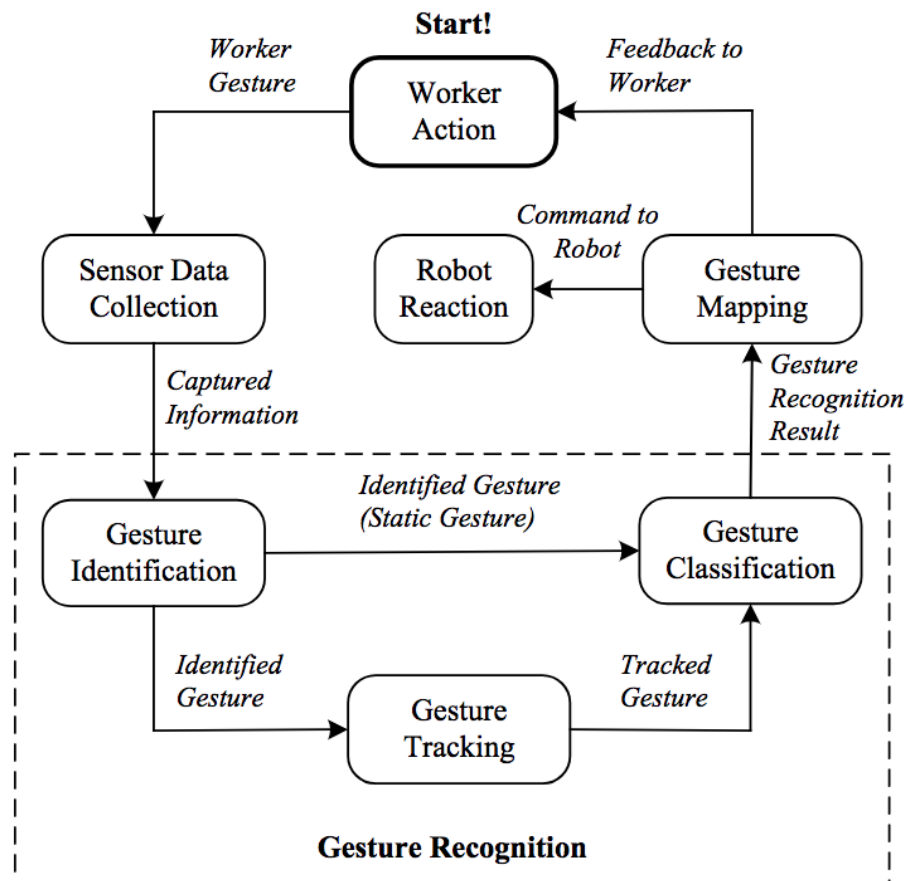


Figure 2 – Gesture Recognition System Workflow Algorithm

At this stage, the system is expected to recognize basic gestures and convert them into computer control commands. Its accuracy and efficiency will undergo further testing. This system has potential for interactive interfaces, particularly in fields requiring contactless control. Next steps involve prototype testing to assess recognition accuracy, processing speed, and compatibility with various operating systems. Research will focus on optimizing recognition algorithms and enhancing adaptability to conditions like lighting changes and other interferences.

References

1. Gupta C. Simulation Modeling of the Mixing Control System with Fuzzy Logic Controller / C. Gupta // Medium. – 2024 (Access date: 28.10.2024)
2. Debnath J., Joe I R. Real-Time Gesture Based Sign Language Recognition System / J. Debnath, I R. Joe // IEEE Xplore. – School of Computer Science and Engineering, Vellore Institute of Technology, Chennai, India, 2024 (Access date: 28.10.2024)