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Face Recognition System for Cloud Robot

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Abstract. This paper proposes a face recognition system for RC-Cloud Robot, which connects cloud computing infrastructure. The robot accesses distributed computing resources and big data and executing multitask like face detection, face recognition and etc. Differently from conventional robot, The ROS (Robot Operating system) has been employed as the operating system of the RC-Cloud server. We have deployed one application, "real-time face recognition application" in the RC-Cloud robot system.

Keywords: Cloud robotics, RC-Cloud robot system, cloud robot, face recognition robot

1 Introduction

Different types of robots can have wildly varying hardware. The source code for a robot usually contains a deep stack starting from driver-level software and including logical processing, sensor data processing, data structure and algorithms. It is an emerging field of robotics rooted in cloud computing, cloud storage, and other Internet technologies centered on the benefits of converged infrastructure and shared services. It allows robots to benefit from the powerful computational, storage, and communications resources of modern data centers. In addition, it removes overheads for maintenance and updates, and reduces dependence on custom middleware [2]. Many robotics researchers have created a wide variety of frameworks which fits the cloud-based requirement to manage complexity and facilitate rapid prototyping of software for experiments, resulting in the many robotic software systems currently used in academia and industry [3]. Our proposed RC-Cloud robot system is an implemented application in ROS. Benefiting by the distributed calculation ability of ROS, three PCs form a cloud host which allows computation to be relocated at run-time to match the available resources.

2 RC-Cloud Robot System

The philosophical goals of RC-Cloud robot system can be concluded as:

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The proposed RC-cloud robot system has a wide range of potential applications in data-intensive or computation-intensive tasks, such as SLAM, grasping and navigation. In our system, the following steps have been executed to connect three machines.

a) One of the three computers has been chosen as the master.
b) All the implemented nodes in the three computers must be configured to use the same master, via ROS_MASTER_URI.
c) Set up the network for all pairs of machines.
d) Advertising each machine must itself by a name that all other machines can resolve.

Our implemented RC-Cloud is a package in the system. A package might contain ROS nodes, a ROS-independent library, a dataset, configuration files, a third-party piece of software, or anything else that logically constitutes a useful module. The goal of these packages it to provide this useful functionality in an easy-to-consume manner so that software can be easily reused.

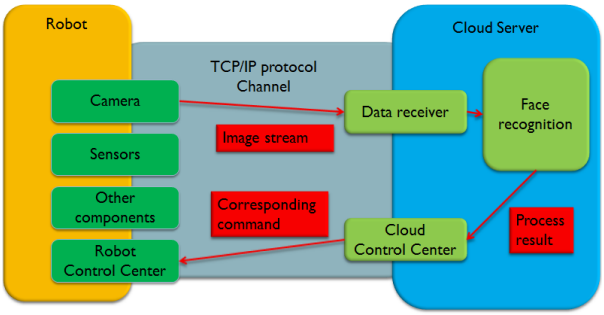

Fig 1. RC-Cloud package and implemented applications in ROS

In order to efficiently develop the services in RC-Cloud system and debug the functions expediently, the “Rviz” tool has been employed in the system. The Rviz is employed in RC-Cloud system to be responsible for mapping virtual robot objects to physical robots, thus saving cost and time.

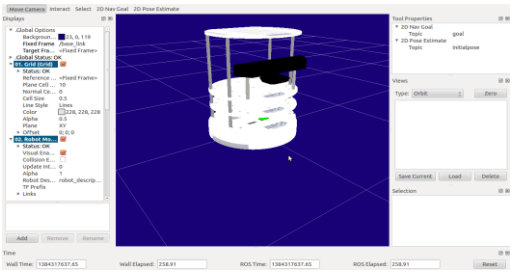

Fig 2. The simulated turtlebot robot in Rviz simulator

Figure 2 shows the simulated TurtleBot robot in Rviz. In ROS, the package "robot_model" contains a few packages for modeling various aspects of robot information, specified in the Xml Robot Description Format (URDF).

OpenCV 2.4 comes with the very new FaceRecognizer class for face recognition, the currently available algorithms are: Eigenfaces, Fisherfaces, Local Binary Patterns Histograms. The "vision_opencv" stack in ROS provides packaging of the popular OpenCV library for ROS. For OpenCV vision_opencv provides several packages:

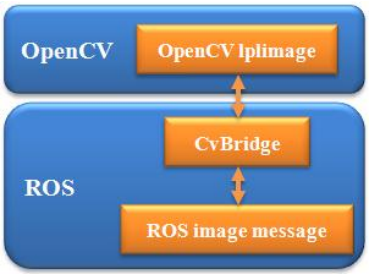

Fig. 3. Communication model between OpenCV and ROS

3 Conclusion

This paper describes design and implementation of a cloud based robot system, the RC-Cloud robot system. Since the concept of "Cloud robotics" was proposed in 2010, the development of this technology has been made great progress. Based on the cloud robotics technology, robots are capable of executing computation-intensive tasks, such as face recognition, SLAM and grasping. Another advantage of cloud robotics is sharing information among robots in the system.

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