People Tracking

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This paper summarizes and discusses current research in the field of people tracking. First, the established hardware, its limitiations and possible combinations are presented. Second, the widely used Robotic Operating System (ROS) and its features of a distributed approach are introduced.

1 Introduction and Problem Statement

Detection and tracking of people is an important feature for many applications. Esepcially in the sphere of mobile robotics - where safe interactions with people are a basic requirement in any situation. But especially in mobile applications there are several limiting constraints as e.g. computing power, field of view and time for decision making.
With the improvement of hardware in the relevant technology sector (e.g. RGB-D cameras, Laser, Thermal View) the number of papers focusing on this topic increased too.
Reliable tracking of multiple persons that are partially blocked is possible with RGB-D camera networks that are set up prior to usage in a room in combinations with solutions like OpenPTrack [1].
The same principles and hardware can be used in mobile applications as in [2]. A different approach is tracking by a combination of laser and thermal view as in [3].

This paper intents to highlight the currently used hardware, the Robot Operating System (ROS) as a framework for the hardware and the basic idea of currently used detection and tracking algorithms.

1.1 Used Hardware

RGB Sensors won't be used on their own as they only deliver depth information when used in a stereo image approach and are usually combined with a depth sensor. This combination provides good enough perfomance to enable resource effiecient and prompt computation of the enviroment.
Laser sensors provide accurate depth readings and a wide field of view but therefore depend on body features like legs for proper detection. They are well suited for close range following and tracking tasks as they provide accurate readings on close distances, in contrast to Depth Sensors [3].
Thermal sensors provide readings that can be interpreted accurately when the targets of interest have a distinct temperature from the rest of the enviroment [4].
Sonar sensors require an active counterpart on the person that is to be tracked. Therefore it is only suitable for tracking of single persons but works well in the outside.

The following table shows a set of the currently utilized hardware for detection and / or tracking of people.

Sensortype	Depth Information	Works in sunlight	Requires Active Tag
RGB	Bad	Yes	No
Depth	Good	No	No
Laser	Good	Yes	No
Thermal	Bad	Yes	No
Sonar	Good	Yes	Yes

Table 1: Summary of common sensor functionality

1.2 Robotic Operating System

Most mobile robotic applications work with the same underlying software framework, the Robotic Operating System (ROS). This framework provides operating system like features, and can be used in a distributed heterogen group of nodes, enabling reliable communication between different sensors, actors and processing units.
The ROS Project is open source and provides a package system that makes sharing of highly specialized solutions between different working groups easy. Integration of these solutions is easy as only a communication between the new node and the existing nodes has to be established.
Figure 1 below shows the node based approach ROS takes. By providing communication between the different nodes it is even possible to stream data to an extern PC for further analysis and processing. All Nodes are registered at a master node and can then communicate directly with each other as needed [5]

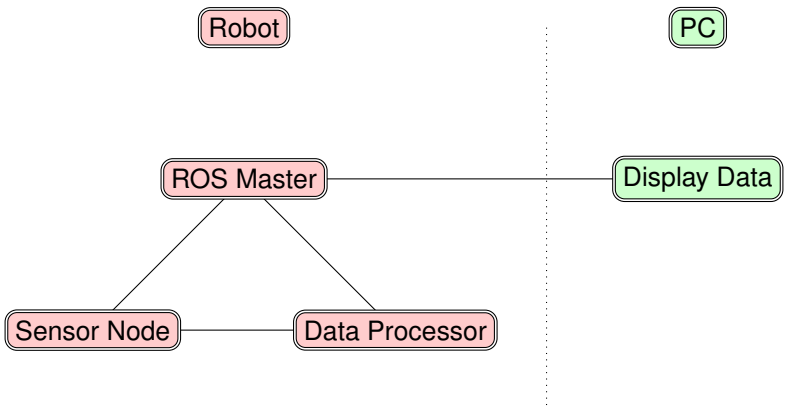

Figure 1: Typical distribution of task on nodes in ROS

2 Methodology

3 Major Findings of the Papers

4 Critical Reflection

5 Conclusion

References

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[2] M. Munaro, F. Basso, and E. Menegatti, "Tracking people within groups with rgb-d data," in *2012 IEEE/RSJ International Conference on Intelligent Robots and Systems*. IEEE, 2012, pp. 2101–2107.

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[5] "Ros Documentation official wiki," http://wiki.ros.org/, accessed: 2016-12-15.