

Cognitive System for Objects Serving in Industry

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Abstract
As cognitive systems become gradually adept at performing simple jobs like moving itself, picking up and delivering the objects. In the context of building the "Cognitive System for Objects Serving in Industry" has ability to learn placement of geographical entities from environment of industries by spatial reference systems, objects identifications, human face detections and image processing. This paper presents the iterative design of a systemic system that uses a computational model for identifying and delivering objects on the basis of a range of spatial reference systems.
Keywords: Cognitive System for Objects Serving in Industry (CSOSI), spatial reference systems, objects identifications.

1. Introduction

In recent years, interaction with the environment and development have become key concepts in cognitive science and philosophy. From their viewpoints, both human beings and systems have bodies that move and have diverse interactions with environments. The solutions must be valid in the real, physical world feasible under constraints imposed by the physical and functional properties of their own bodies.

Cognitive systems that work in human community like convenient human-machines that perform the specific tasks, such type of technology is never ending struggle for system designers. This paper demonstrate the mechanism of Cognitive System for Objects Serving in Industry, how to serve objects in undefined environment where CSOSI first time deliver objects to the end point. He can define best route by using RatSLAM [1] feature named as spatial reference systems to end point, this route learn from environmental object placement in such industry. Path learning, humans and objects identification are the featured part of CSOSI.

Ability of acquiring knowledge from users. A straightforward way is to utilize human-system dialog as means to acquire a variety of knowledge from users or designers, including descriptions about the environment. Appropriate degrees of autonomy. Although we do not expect a CSOSI can do everything by itself, some degree of autonomy is required absolutely. An autonomous system should be able to make use of acquired knowledge to solve problems, especially, plan for complex tasks.

1.1 Assumptions

1.1.1 Common users: Typically, an intelligent CSOSI is expected to serve untrained and non-technical users. As a consequence, the system should be equipped with some intuitive, human-oriented user interface, so that it can be employed by these users without instruction [2]. A huge amount of efforts have been made on this "uppermost" requirement and a variety of techniques for human-system interaction have been developed, including spoken language recognition, sometimes integrated with more traditional techniques such as graphical user interface.

1.1.2 Human-system collaboration: In many cases, human users need to assist the system on its missions one way or the other. An example is task learning, where a human teaches a system how to perform a specific task through a combination of spoken commands and observation of the human's performing that task [3]. More generally, it is proposed that human users and system(s) should collaborate to solve problems, where humans assist system(s) with cognition and perception.

1.1.3 Under specification: Unlike an industrial system, the tasks of an CSOSI are frequently underspecified, i.e., not predefined completely, because users usually provide underspecified descriptions about their intentions (e.g., tasks) and the environments are typically unpredictable and dynamic [2]. The systems have no sufficient capability to response/adapt to their unpredictable and dynamic environments means stairs exist in such industry, as well as the users. CSOSI have no capable for going to up and down by stairs in the industry. Systems that are using in CSOSI have ability to pick up or grip the objects like PR2.

1.2 Problem Statements

- **Problem setting ability:** Machines can process symbols quickly but cannot set problems by themselves.

- **Domain-specific knowledge:** The more closely related a problem is to the real world, the more human beings utilize their wide repertoires of domain-specific knowledge to solve them. Most of this is implicit knowledge that is held unconsciously or recruited according to physical or environmental cues.

- **Heuristic knowledge:** To solve problems in the actual world, human beings quickly select a finite number of information items required at a given moment. Machines cannot do this (the frame problem). Although heuristic solutions may be difficult, even for humans in novel complex situations, humans can avoid being brought to a standstill by acting as if the frame problem did not exist.

- **Symbol grounding problem:** Machines cannot associate symbols used for language processing or computation with actual objects and phenomena in the world.

- **Binding problem:** Humans can process multiple characteristics of an object in a parallel and distributed manner and finally bind them all together as the characteristics of the object (e.g. processing elementary information of a mango: "color, size, roundness, hardness, smell, taste, etc.," and rebinding them as "a mango").

2. Model of Cognitive Objects Serving System

This model represent the overall internal mechanism of CSOSI. Sensory system of CSOSI relying on voice sensors and image sensors. The voice recognition based on NLP and OpenCV using for image processing. Sensory system directly connected to the memory section of CSOSI as shown in Figure 1., that store the data in LTM and MTM and as well these LTM and MTM using WM and store temporary data in SM. The RatSLAM system is using to perform spatial mapping and system navigation [1]. RatSLAM is a system simultaneous localization and mapping (SLAM) system based on models of the mapping and navigation processes. The experience map is of particular relevance to the work described as it provides the underlying spatial representation on which the lexicons are built and by which the systems navigate. The experience map consists of nodes, called experiences, and links between those nodes that encode the experiences "relative spatial arrangement, and the time the system took to transition between the connected experiences. To plan a path between the system's current location and a goal location, the node in the experience map associated with the system's current location is seeded with a time stamp value of zero. An iterative routine then propagates time stamp values to all other experiences. The shortest route to the goal is calculated by performing gradient descent from the goal location. Once a path is calculated, the system navigates the path using a mixture of local movement behaviors and obstacle avoidance. A more detailed description of RatSLAM and the navigation processes is given in [1].

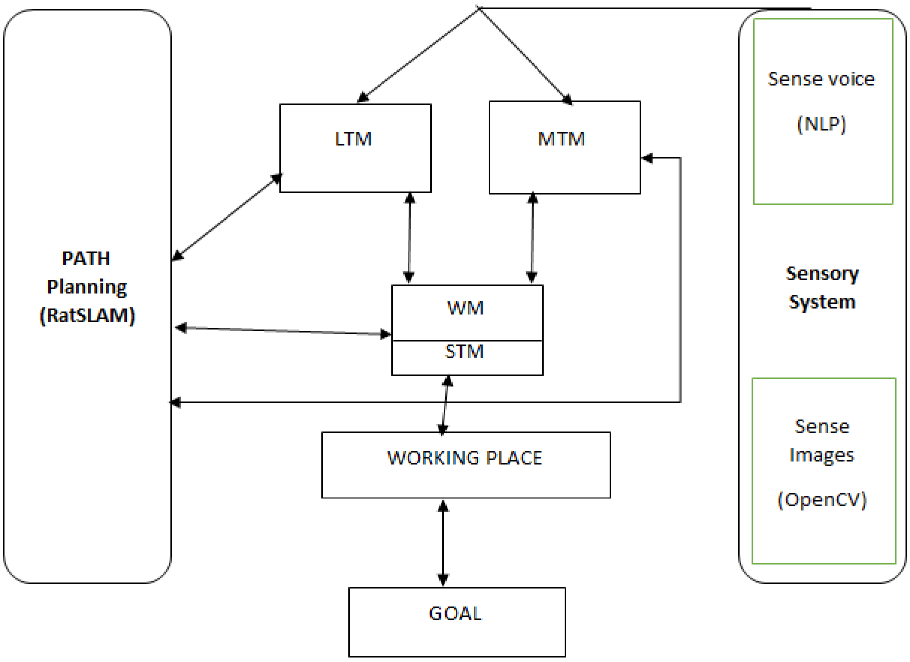

Figure 1: The architecture of CSOSI

3. Case Study

Now move to conduct several types of case study in the efforts on CSOSI. Standard tests including in Case Study, building a map of an unknown environment, identifying humans, following an unknown person through a dynamical environment. The aim of this case study is to verify CSOSI "basic capabilities". It is not necessary for a cognitive object serving system to pass these tests by using the main technical contributions described in this paper.

Action	Function
Go to a location	Drive to the assigned location from the current location [4].
Pick-up an item	Pick-up the assigned item, return "importable" if the item is not portable
Put-down at a position	Put down the item in hand at the assigned position
Search for an object	Search for the assigned object through sensors and return the position of the object if succeed

3.1 Case Study (Waiter System in a Restaurant Industry)

There are different types of instructions that can be given by the manager of restaurant. The manager can decide the target table for the system by referring to the current position of the system; he can provide the seat number of the destination to the system in the form of instructions (by voice or view the seat number card). RatSLAM is helpful to system mapping cognitively and PR2 Willow Garage features implemented in CSOSI. The objective of the task is to deliver the objects (food) to the customers of the restaurant (i.e., minimize the total stay time of all the customers) by minimizing the movement time of the system. On the other hand, the system simultaneously aims to maximize the appreciations received from the customers and the sales of the restaurant by minimizing the customer's waiting time before they are guided to a seat or before the system takes their order. In principle, the waiter system [5] has two types of choices i.e., it can move by following the manager's instruction, or it can move autonomously by complying with its build-in rules or by using previous knowledge. For example, the system may move towards a customer who is sitting at the table nearest to its current position and waiting to place his order, or it may move along the shortest route to provide services to two or more customers who are waiting to be served. In general, the system always tries to move along the best route (by using RatSLAM), in order to receive maximum appreciations and reduce the waiting time of the customer's. The system needs to strike a balance between maximizing appreciations and minimizing waiting time. In order to achieve the former, the system moves along a complex route to provide services to the maximum possible customers. However, in order to achieve the latter, the system moves along a simple route to a customer who has been waiting to be served a long time. A customer who has been waiting for a very long time may leave the restaurant, causing a loss of sales and revenue; therefore, it is necessary for the system to clear the tables immediately after the customers leave, so that there is a sufficient number of available vacant tables for new customers. If any person stand in the route of the CSOSI then he can recognize by OpenCV and able to wait some moments otherwise change the route. The amount of restaurant's sales is a type of reward that the manager aims to maximize. This amount relates to the number of customers who place orders and do not leave. The amount of appreciations/feedback received by the system can only be known by it. The system always tries to maximize the appreciations it received. On the other hand, the human instructor, who plays the role of a manager, A Platform System for Developing a Collaborative Mutually Adaptive Agent has no knowledge of the amount of appreciations/feedback received; therefore the manager prefers to instruct the system to serve the table nearest to its current position. The entire evaluation function is assumed to be shared by the system and the manager.

4. Conclusion

This paper has investigated a method for learning and recognizing objects, humans and abstract spatial concepts using the RatSLAM model. The case study demonstrate that it is possible to learn abstract spatial concepts such as industry based and then generalize about these concepts when revisiting the physical areas. The architecture combines localization and mapping with planning and navigation.

5. References

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