Other types of writing

Literature review

PURPOSE

The literature review is a survey of the literature on a particular subject or area of interest. It involves finding out what literature is available on the subject, what the main areas of research are, who the prominent researchers in the field are, and what the current and possible future research questions are. Significantly, a literature review involves a discussion of the research debates, that is, which researchers agree or disagree with each other and why.

In thesis writing, literature reviews function as a point of departure, providing background information for the area of research, and allowing the researcher to 'position' their research into the current debates around the field of study. The literature review in a thesis helps justify doing new research, pointing to a gap in the current knowledge, which the research student aims to fill.

The following excerpts from a student literature review were written as part of a graduate Computer Science subject. The topic was modelling biological sensors, and the student was required to provide an overview of the topic, survey current research, compare theories and models, and draw some conclusions about the current state of knowledge in the area.

Example: literature review (excerpts)	
Introduction	*headings divide information into sections*
When designing sensory systems for robots, one good source of inspiration is nature. Animals, big and small, have sensory abilities that enable them to move around in unknown surroundings and respond to different kinds of situations, which is what we ideally want mobile robots to be able to do. If we are able to understand how the animal sensors work, then we should be able to make a model of the sensors and adapt them to work with mobile robots.	*orientation to topic*
One problem with mobile robots is how to get them to navigate safely in rough terrain. Here, legged vehicles are more adaptable than wheeled ones, but then there is the problem of coordinating the movement of the legs.	*outlines whole review*
Research has been done on how insects and other anthropoids control their legs while walking and how that can be incorporated into a mobile robot (Beer et al., 1991; Zill and Seyfarth, 1996; Delcomyn et al., 1996). Other areas where biological sensors can prove very useful is with tactile sensing in industrial robots (Fearing, 1990; Speeter, 1990), and in robot guidance where a short-lived chemical marker and odor sensing can be used for robot guidance.	*previews topics to be covered* *1. tactile sensing* *2. odor sensing*
In this literature survey, I will attempt to give an overview of these areas and of the current state of knowledge …	*aim of review*
Tactile sensing	
There are two distinct approaches to the area of tactile sensing. One is to design a "finger" with tactile capabilities, as R S Fearing describes in an article in the *International Journal of Robotics Research*. Another is to design a tactile sensing mechanism that is adaptable enough in order for it to be applied to an existing gripper, as done by Thomas H Speeter in the *International Journal of Robotics Research*.	*overview for new section* *approaches and key researchers*

Local contact information from the fingers of a gripper is important for a robot to manipulate an object efficiently. The information one can receive from tactile sensing mechanisms includes the presence or non-presence of contact, the location and pattern of contact and the distribution of forces between different contact points. Two different approaches to obtaining the information exists: a finger tip sensor with a strain gauge structure, and an array of deflection transducers. The array sensor approach has the advantage of giving the shape of the contact area with a single movement.

background information to problem both approaches try to solve

In Fearing's article, he describes the design of an experimental device for laboratory use in sensory and manipulation research. The main features of the design is a molded rubber finger consisting of a cylindrical portion and a hemisphere at the tip, with a total of 8 x 12 capacitive sensing elements under the surface. The finger size and shape were chosen for good grasping. As contact can occur anywhere on the finger, complete sensor coverage is needed, not only on the palmer surfaces of the finger. The array of elements is scanned at a rate of 7 Hz, which is adequate for the analysis of static forces. The sensors are spaced at 3.3mm along the length of the finger and 18° around the circumference. To reduce aliasing, the sensor depth should be twice the sensor spacing, but as the sensitivity is inversely proportional to depth, a sensor depth equal to the spacing was chosen as a compromise. Experiments on the strain measures with increasing weight shows that the tactel output is almost linear even with large deflections of the rubber.

first approach: design of "finger" with tactile capabilities

Unlike Fearing, Speeter describes in his article a project to design a tactile sensing system for use with an already existing gripper, the Utah/MIT Dexterous Hand. The objectives are to sensitize the palmer surfaces of the fingers to allow detection of contact, detection of the pattern of contact and a measurement of the contact forces. The flexible tactile array, allowing the application of tactile sensors to existing grippers, has provided the possibility of sensitizing complex grippers without material integration of sensors into the surfaces, lowering the development and replacement costs of sensing arrays. Central to Speeter's sensing system is a flexible array that can be bent and applied to any planar or cylindrical surface.

second approach

description of research objectives

(discussion of Speeter's model continues …)

Summary

Although the work that is being conducted in several areas regarding biological sensors shows significant progress, we still have quite a lot of work to do in order to understand how the biological sensors in insects and other animals interact and exactly what effect they have on animal behaviour. The work done by Beer et al. shows that it is possible to model parts of a nervous systems and that the model shows some of the same characteristics that can be observed in real animals. But the step from generating insect gait patterns with distributed neural circuits to incorporating all the sensory input from tactile and stress receptors into the locomotion controller is still quite large. Other work on tactile sensing for robot "fingers" and robot guidance with odor sensors has laid the groundwork for further research into the possibilities of expanding these areas and including them into a mobile robot. All the different parts show promising progress, but there is a lot left to do before we are able to build robots that are anywhere near as versatile as the animals they are modelled on.

summarises whole review of current research

highlights achievements and shortcomings

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