Enabling Citizen Roboticists

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Abstract

Citizen roboticists are lay people who conduct robotics research with the goal of improving the quality of life. The authors surveyed citizen roboticists (i.e. hobbyists) at a conference and via mailing lists to determine the software they need to support automation. Robot automation enables more complicated tasks with minimal extra work. The results of the survey identify which software tools developers should be providing to aid citizen roboticists. In addition, the results indicate that most citizen roboticists use C/C++, so developers should provide support for these languages.

Introduction

The field of robotics has largely been dominated by academic and industrial researchers. Because of this dominance, most tools and technologies have been developed by academics and companies for their own use. Rather than being general purpose tools, these tools are specialized to ease certain tasks on certain platforms. However, there is a third group of people who are active in robotics, citizen roboticists. Because of the dominance of academic and industrial researchers, it is not clear whether the needs of these citizen roboticists are being considered during tool development.

This paper presents the results of a series of surveys that were developed to determine the current state of tool usage among robotics hobbyists. The goal of the surveys was to better understand whether or not the needs of these citizen roboticists were being adequately met. The website Meetup.com (http://robotics.meetup.com) showed that there were 8,257 hobbyists participating in robotics. Therefore, there are a large number of hobbyists that could contribute to the field if they had access to tools that fit their needs rather than the needs of academia.

Background

Before the needs of citizen roboticists can be addressed it is important to identify who they are and why they are an important resource. To do so, this paper examines three subtopics: 1) citizen science, 2) existing citizen robotics groups and 3) untapped resources related to citizen roboticists.

Citizen Science

Citizen science is a type of research in which volunteers, who may or may not have training in a given field, perform tasks that support research, such as observation or measurement. Many projects in the study of animal and plant life cycles have utilized networks of citizen scientists. Perhaps the most successful has been the Audubon Christmas Bird Count. This project has been held since 1900 and is an example of the exponential growth ability of citizen science projects. In 1900 there were only 100 participants in the Count, in 2000 52,471 people from 17 countries participated (Audubon 2010).

Citizen Robotics

Citizen science has only recently been introduced in the field of robotics. The groups working in robotics tend to be small, with only 50-100 people per group. The largest groups are Boston Robotics with 125 members and a widely distributed online group known as The Robot Group with 250 members. These groups participate in competitions that test the designers' abilities to create robots that can autonomously find paths in varying conditions.

Untapped Resources

Based on information available on Meetup.com, a large number of citizen roboticists do not have groups to work with. These numbers are meaningful because Meetup.com

is a site for people interested in different hobbies to arrange meetings with people of like interests. According to the website, approximately 40% of people who are interested in robotics currently do not have a group to work with.

Methodology

To gather information about citizen roboticists and their needs, a series of surveys were conducted. The first survey was generated based on discussions with graduate students at the University of Alabama who specialize in robotics research. This survey was distributed to participants in the Seattle Robothon. The results of this survey then lead to the development of a second survey.

The second survey was developed online via the SurveyMonkey website. It was distributed nationally using mailing lists for the following hobbyist groups:

- The Atlanta Robotics Meetup
- The Boston Robotics Meetup Group
- hackerspaces Buffalo NY
- The Mid-South Area Robotics Society
- MTRAS ~ MidTn Robotic Arts Society
- Philadelphia Robotics Group
- The Robot Group
- The Southern Crescent Technology Meetup Group
- Tampa Bay Microcontrollers and Robotics
- Does your robot's microcontroller boot Linux and grok GSM?.

The first survey received roughly 20 responses while the second received 38 responses. The purposes of these surveys were to find out from hobbyists what tools they currently used and what features tools needed to possess in order for the groups to be able to use them to aid in larger-scale research as citizen roboticists.

Results

The results of the survey suggest that, while not many hobbyists use the tools that currently exist, there are common threads to what citizen roboticists need from tools. This paper describes two of the findings more closely: 1) programming languages and 2) the features tools need to ease the transition from hobbyist to citizen roboticist.

Languages in Use

By far the most popular programming language in use is C. C accounts for 37.5% of the programming languages used in total. Over one-half of the respondents who only use one programming language use C. The other languages that are prominently used are C++ and Java. However, only three people who use C++ do not use C and everyone who uses Java also uses either C or C++.

Needed Features

To determine what tool features were needed, survey participants were given a list of features to choose from and were additionally allowed to describe any features they would like that were not listed. Most respondents would like most of the features that were listed. However, the most commonly requested features were built-in automatic mapping and obstacle avoidance which were each chosen by over half of the participants.

Discussion and Future Work

The discussion during the presentation at the workshop raised a couple of questions that provide topics for future work to better enable citizen roboticists. The first question was what do people who have some training, but still only participate in the field as a hobbyist need to go deeper into the field. It would be useful to establish if this group of people is of a considerable size. If so, another survey is needed that is directed toward them to see if the results differ. The second question was why hobbyists do not use existing tools. This question must be answered so that the same problems will not be repeated. It was also suggested that it would be useful to look into how Arduino operates as that is an attempt at simplifying the process of programming a robot.

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