

2013 臺灣國際科學展覽會
優勝作品專輯(國外作品)

作品編號	100046
參展科別	工程學科
作品名稱	Equipping, programming and testing a robot searching for an avalanche transceiver
得獎獎項	四等獎

國 家	Switzerland
就讀學校	Schweizerische Alpine Mittelschule Davos
作者姓名	Patrik Herzog Nicholas David Bresina

ABSTRACT OF EXHIBIT

TAIWAN INTERNATIONAL SCIENCE FAIR

1. Purpose of the research

Because we live in a famous winter sport region in Switzerland, we have been confronted with the problematic of avalanches since we were born. In winter 2011/2012 alone, 179 people were involved in an avalanche accident, of whom 25 died. The most important device for searching and rescuing a buried person is the avalanche transceiver. It creates an electromagnetic field, which can be used to locate a buried person with another transceiver. The most important factor while searching is time: After 30 min. the chance of survival of a buried person has dropped to 40%. Considering the fact that people often make mistakes when they are put under such a big stress, valuable time gets lost.

This is where our project comes into play. With an automation of the searching process a fast and reliable search should be achieved. The aim we agreed on for this paper is to develop a prototype of a robot that can find an avalanche transceiver automatically and reliably.

To study and optimize the functionality of our robot more easily, our tests have only been performed on flat ground.

2. Procedures

The components of an avalanche transceiver with only one transmitting antenna are used as a receiver. With the help of this receiver, the signal of a transmitting avalanche transceiver was analysed. Furthermore, the results were used to evaluate the most suitable search technique.

Our robot is based on the “RP6” robot system, which is programmable in the C-language.

The signal of the receiver is modified in a way which allows the robot to read it. Based on the results of the signal analysis, a search algorithm is developed.

In the final tests the robot was examined as to its functionality and efficiency. Therefore, the robot was positioned at randomly chosen starting points to locate the transmitting device.

3. Data

The transmitter could be located correctly in every test. The starting points were successfully located up to 11 m from the transmitter. The search ending points were found at a maximum range of 0.5 m from the correct position.

4. Conclusions

In view of the results, the aim of developing an automatic localisation of an avalanche transceiver on flat ground as a prototype is seen as fulfilled. Outside the specified range, the transmitter can only be located unreliably. This is due to the fact that outside that range the signal differential in different directions is too small to be processed by the robot.

Our prototype was tested under ideal conditions. Certainly, our robot is still some way from being ready for use in an actual avalanche. Many different questions have not been answered yet or have come up during this project, for example: ‘How should the robot should be applied on uneven terrain?’ or: ‘How should it deal with several buried people at once (multiple transmitted signals)?’ Two aspects of our prototype, the low weight and the low construction costs, however, are particularly favourable.

評語

利用小機器人搜尋大雪遇難的人，自己製作小機器人在雪中尋找埋在雪中的人，若配合直升機更能發揮小機器人之功能，對於平面搜尋與垂直搜尋的探討，已有一番探討活動。