Automatic poster evaluation

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Abstract

Classically, poster sessions and similar individual contributions in exhibitions are evaluated with paper-based scoring sheets. This type of evaluation typically suffers from low response rates and depends on the memory of the attendants.

In this work we propose a pervasive system that aims to fully automate the evaluation process. The key assumption of our approach is that the cumulative time people spend in front of a poster is a measure of how much they like it. The challenges associated to this hypothesis are twofold. Firstly, monitoring of persons within a given distance of the poster is needed. Secondly, the measurement of time spent is biased regarding the *crowdedness* of an area, since posters in frequently visited areas receive more attention than posters in quieter areas.

In our approach, we use an ultrasonic range finder to measure distance profiles of people to posters. From these profiles, the time during which people are interested in a specific poster is calculated. Furthermore, the crowdedness in an area is found from the distance profile and serves to estimate the bias. Using these quantities, the appreciation of the attendants for each poster is determined.

1 Introduction

Monitoring and evaluating posters at poster sessions can be difficult and tedious. A jury would have to grade all posters in the given time. An evaluation form for attendants to fill in can result in a low response rate, or can become biased to the responding sub-group. Therefore, an automatic solution to evaluate contributions would be a useful tool. The goal of the system described in this work is to automate the evaluation of posters. It will be used at the Pervasive 2011 poster session.

To measure the appreciation for posters by attendees, we make the following assumptions:

1. The more people like a poster, the longer they will be interested in the poster and consequently spend more time reading and discussing it.
2. People interested in a poster will be within a distance d from the poster.

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From these assumptions it follows that by measuring the distance of people to a poster, it should - in principle - be possible to determine the appreciation for the poster. The described system uses an ultrasonic range finder to measure distance profiles over time between the poster and objects in the vicinity, and uses this to reveal the appreciation of attendants for the posters.

Ultrasound has been used before for localization [1]. In other work passive infrared (PIR) movement sensors have been used to detect movement direction and to count people [2]. This provides information about moving people in the vicinity of the sensor. Our approach instead needs to detect stationary people.

The main challenge is to compensate for the inherent bias that such time-distance measurements will show. Given their location, not all posters will be visited equally often by conference attendants. Instead, some posters will receive more attention than others and as a result, these posters would appear to the system as being more interesting under the naive assumption of a direct relation.

Conference crowds have been monitored before [3], but not using fine grained proximity measurements as used in our approach. This work instead focusses on visitor distance estimates to determine the intentions of conference attendants.

2 Method

To estimate the appreciation A of a poster by an attendant, the total time that persons spend in front of a poster below a critical distance d must be measured. We define the following key timing parameters:

1. t_c: the total time that people spent closer to a poster than the critical distance d. According to the initial hypothesis, this corresponds to a biased version of the appreciation for a poster.
2. t_a: the total amount of time people spent farther away from the poster than d.
3. t_n: the amount of time with nobody in the vicinity of the poster.

With these definitions, the crowdedness C in the vicinity of the poster can be expressed as:

$$C = \frac{t_a}{t_a + t_n}. \tag{1}$$

Thus C describes the amount of time that people who are not interested in the poster spend in the vicinity of the poster, relative to the total assessment time when nobody is in the vicinity. Consequently each poster is characterized by two parameters: C and t_c.

Next, we group posters with a similar value for C and let C_i denote the crowdedness of group i. If we assume that there are sufficiently many posters in group i, the average appreciation $\bar{A}$ will be similar in each group. Therefore, we can say that $\bar{t}_{c,i}$ corresponds to $\bar{A}$ in each group. Thus, we have found a relation that allows to compare the appreciation of posters with a different C.

To validate the made assumptions and test the performance of the described approach, the results of this system will be compared to the outcomes of a questionnaire. The questionnaire should evaluate following aspects:

– Which posters did the attendant like? A ranking should be given for the posters that the attendant visited.
– Is the poster structure clear? Are all parts clearly distinguishable?
– Are the goals and approach of the presented work clear from the poster?
– Is the presenter able to explain the information in an understandable way?

3 Implementation

Using the time difference between emitted and received ultrasound pulses, an ultrasonic range finder computes the distance to objects. The output is a voltage difference which represents the measured distance. An illustration of the installation the active area of an ultrasonic range finder is given in Figure 1. The exact shape of the sensing area depends on the type of sensor. The two factors to consider when choosing a sensor are the angle of the field of view and the maximum distance that can be detected.

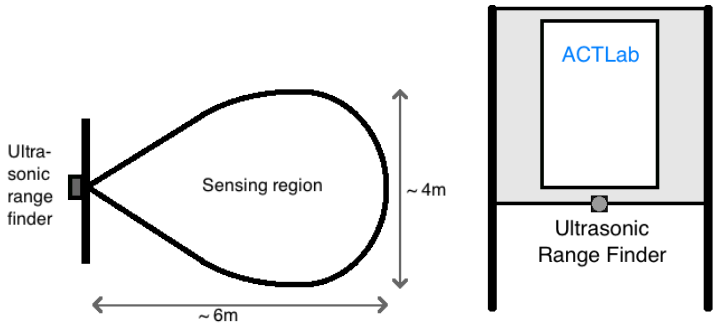

Fig. 1. On the left, a top view of a poster is given and the sensing region of the sensor is indicated. The exact shape of the sensing area depends on the sensor type. On the right it is shown how the ultrasonic range finder is positioned near a poster.

Since we are only interested in the total amount of time a distance is measured, the processing of the sensor signal will be straightforward. All that has to be done during measuring time is comparing the measured distance to a threshold, calculating the time during which the distance was measured, and storing those time intervals. This can be done with virtually any simple micro controller. Afterwards, all data can be retrieved from the sensor nodes and processed at the same time.

4 Discussion

In the ideal situation, every person within a certain distance from the ultrasonic sensor is interested in the poster, and every other person that is farther away

is not. However in practice there are a number of factors that influence the measurements. A few of the most important threats to this system are discussed.

Obviously using a distance as a threshold to regard people as interested is a simplification. However, it is reasonable to assume that the bias introduced by our approach is the same for every poster so that the negative effects cancel out.

Another problem is that during presentations, the presenter of a poster is always close by. This will influence measurements. However, posters can be monitored outside presentation times too. This allows for an analysis dependent and independent of the presentation session.

Another influencing factor can occur when posters are located close to each other. In this case the sensing regions may overlap and visitors may influence multiple poster readings at a time while only interested in one poster. This situation can be largely avoided by careful placement of sensors and spacing of posters.

Furthermore, it is possible to artificially boost ratings of a poster by deliberately visiting a specific poster multiple times. There is not much that can be done about this without identifying people. This would require a far more complex installation which is contrary to the principles of this installation.

5 Further work

Since this is a first time attempt to automatically evaluate posters, there are a number of improvements that can be made to the approach. These improvements will benefit from the experience gained from a first installation. Instead of only considering the critical distance d when determining if people are interested in the poster, more information can be obtained from the ultrasonic range finder. An interesting approach is to reveal the intentions of people by looking at distance patterns. When the distance to the poster is not varying, this likely means that the closest person is reading the poster. Conversely, if the distance is varying, this means that the person is likely not reading the poster, but doing something else. This could also mean that people are passing by the poster without taking any interest in it.

Finally, the system could be extended in such a way that the number of people in front of a poster can be detected. This allows further reasoning about the appreciation for the poster.

References

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