

# Roaming Robots

## Evaluation Report

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**FCT** Fundação para a Ciência e a Tecnologia  
MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR

**IOP** Institute of Physics



## Summary

The present work is part of a post-doctoral research project, 'Generic Venues: Researching the impact of science communication in non-traditional locations'. This in-depth public engagement research project involves a thorough investigation of best practice in science communication within 'generic' venues - locations where audiences naturally congregate and have 'ownership' of the site; spaces that are not normally associated with scientific learning. The research is taking place at the Science Communication Unit (SCU) at the University of the West of England, Bristol (UWE, Bristol) and is funded by the Fundação para a Ciência e Tecnologia<sup>1</sup>, a Portuguese governmental institution.

This report summarises evaluative data from the busking activity 'Roaming Robots'. 'Roaming Robots' aimed to take simple physics demonstrations directly to the public via informal 'busking' activities. Working with experts on science busking and researchers (roboticists) from the Walking With Robots<sup>2</sup> network, the event was organised in order to demonstrate physics principles relevant to the area of robotics research. 'Roaming Robots' was awarded with a 'Public Engagement Grant Scheme' from the Institute of Physics<sup>3</sup>.

The activity was used as a case study for the research project mentioned above. For further information about the research programme more generally, including other case study examples, please see <http://www.scu.uwe.ac.uk/index.php?q=node/197> .

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<sup>1</sup> <http://alfa.fct.mctes.pt/index.phtml.en>

<sup>2</sup> <http://www.walkingwithrobots.org/>

<sup>3</sup> <http://www.iop.org/>

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## 1. Introduction

'Roaming Robots' took simple physics demonstrations directly to the public via informal 'busking' activities. Working with experts on science busking and researchers (from the Walking With Robots network – WWR), the team delivered activities demonstrating physics principles relevant to the area of robotics research. Researchers were introduced to the concepts of 'science busking' and they delivered the busking activities at the bandstand of the Trafford Centre, a large and very busy shopping centre in Manchester.

Through the appealing subject of robotics the project aimed to attract the attention of passers by and introduce them to various physics principles. This activity occurred on October 26<sup>th</sup> and 27<sup>th</sup> 2009 in Manchester, during schools half term. It gained significant added value through the one-off Festival of Robotics, which was occurring at the time as part of the 2009 Manchester Science Festival.

The original project plan was to perform two days of busking at a 'generic' venue, however, due to several reasons it was not possible to recruit enough roboticists for the busking on the first day. Due to illness and anticipated emergencies, the number of roboticists available was lower than originally expected. To overcome this issue, the 'Roaming Robots' team decided to set up an additional stall at the exhibition hall where the Festival of Robotics took place (Museum of Science and Industry – MOSI). Although this was not an informal venue, the team was able to engage with a high number of people. On the second day, busking activities took place in a local shopping centre (Trafford Centre).

The activity was organised by Margarida Sardo (SCU at UWE), Karen Bultitude (SCU at UWE) and Claire Rocks (Walking With Robots coordinator).

### 1.1. Aims

The overall aim of this project was to raise aspirations and improve attitudes towards physics, specifically related to robotics. This was achieved through a range of busking activities delivered within a non-traditional venue. The project specifically aimed to reach people who are not normally interested in or engaged by physics related activities, by taking the science directly to them.

More specific objectives included:

- To present 2 days of busking activity on robotics in a 'generic' (non-traditional) venue during October 2009
- To engage at least 120 local participants with science and key physics concepts
- To develop the skills for delivering entertaining and informative demonstrations in at least 10 robotics researchers
- To develop at least 3 physics busking activities relevant to researchers area of expertise

### 1.2. Staff involved

In total, 7 researchers were involved in the busking activities. The researchers involved had a variety of roles, from undergraduate student through to senior academics. They also presented different levels of busking experience: from experienced buskers to researchers with very little experience at science busking.

David Price, a science communicator from 'science made simple'<sup>4</sup> was involved in the activities providing busking training, helping planning the events and supporting researchers in the development of their skills.

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<sup>4</sup> <http://www.sciencemadesimple.co.uk/>

### **1.3. Venue and Schedule**

Initially, the plan was to take the busking activities to Piccadilly Train Station, in Manchester. After contact and discussion with local experts, who knew the area and the venues, and following their advice, the Trafford Centre (a shopping centre) was used as a 'generic' venue for this activity. The exhibition hall at the Museum of Science and Industry was also used as a venue for one day of busking.

#### **1.3.1. MOSI**

The Museum of Science and Industry (MOSI) is located in Manchester city centre and its mission 'is to make Science and Industry inspirational, highlighting our region's rich and continuing contribution'<sup>5</sup>. MOSI is open from 10.00am - 5.00pm every day, except 24 - 26 December and 1 January. Entrance is free.

The team set up a table was around 9.30am, on 26<sup>th</sup> October, and the Festival opened its doors at 10am until 4pm. The team was busking during that period of time.

#### **1.3.2. Trafford Centre**

The Trafford Centre is a large indoor shopping centre located in the Metropolitan Borough of Trafford, in Greater Manchester. It has 137,346.65 square metres (1,478,387.0 sq ft) of retail space and attracts 30 million visits annually<sup>6</sup>. The stores are open Monday–Friday from 10 am – 10 pm, Saturday 10 am – 8 pm (some stores opening at 9 am) and Sunday 12 noon – 6 pm with some stores open from 11 am.

Services from the centre's bus station link the shopping centre with Manchester city centre, the surrounding towns, the Metrolink station at Stretford and Manchester Airport. There are over 10,630 car spaces and 350 coach spaces.

The table was set up around 9.30am, on 27<sup>th</sup> October, and everyone was able to get familiar with the venue. As people started to enter the shopping centre, the team realised that although the bandstand was an appropriated location (lots of passers-by), it was easier to attract people in the area surrounding the bandstand. The bandstand was located at the centre of the shopping mall and it was at a junction between 3 pedestrian thoroughfares, near the restaurant area. It was an octagonal structure, raised about a metre from the ground, surrounded by a heavy wrought-iron balustrade. There were two sets of steps leading up on to the bandstand itself.

Roaming Robots was programmed and scheduled to occur in between two informal Café Scientifique<sup>7</sup> (scheduled at 11am and 3pm). Prior to the beginning of the activities, David Price had small and informative chats with the buskers. After the Café Scientifique, buskers engaged with the public from 12noon until 3pm (when the second session of the Café Scientifique started). Because some children were present during the Café Scientifique and got distracted easily, they engaged with the buskers and were able to see some science tricks and have a go with the robots, while chatting with the buskers.

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<sup>5</sup> <http://www.mosi.org.uk/about-us/what-we-do>

<sup>6</sup> <http://news.bbc.co.uk/1/hi/england/manchester/4308332.stm>

<sup>7</sup> <http://www.cafescientifique.org/>



**Figure 1.** Map of the shopping centre layout. The location of 'Roaming Robots' is indicated by the red dot.

#### 1.4. Busking activities

The team involved used several busking activities and demonstrations, such as:

- Swarm games (a practical activity where participants follow 3 simple rules to organise Frisbees into piles, demonstrating principles behind swarm robotics)
- E-pucks (a small differential wheeled mobile robot)
- Optobots (a robot that is capable of detecting and following light sources)
- BigFoot (the first two servo-motor Biped Walking Robot in the world<sup>8</sup>)
- Pleo (an animatronic dinosaur toy designed to emulate the appearance and behaviour of a week-old baby dinosaur)
- Robot Nobot (discussion-based game, where participants organise pictures into the categories Robot or Nobot (not a robot). Participants are encouraged to discuss attributes of robots)
- Marshmallow Man (with the marshmallow man experiment, visitors get to explore the effect of the forces that act on a human body if they are left stranded in space without a space suit)

There were also available some general science busking activities, which were performed by David Price, such as rope puzzles and illusions.

<sup>8</sup> more information: <http://davidbuckley.net/DB/BigFoot.htm>

## 2. Evaluation methodology

A variety of evaluative techniques were employed in order to judge the effectiveness of the 'Roaming Robots' activities in the chosen venue. Audience reactions to the activities were collected in two ways:

- **Observations** - The activities were observed by the evaluator, who took extensive contemporaneous notes on the size, composition and reactions of the audience. The scheduled observations took place 3 times, for period of 15 minutes each time. A copy of the observation schedule is included as Appendix I.

- **Staff interviews** - Interviews took place with staff involved in both organising and delivering the activities. Staff members were asked to provide both formal and informal feedback of their impressions of the event. A copy of the staff interview schedule is included as Appendix II.

During the activities, buskers gave out stickers to the audience, in order to count the number of people reached.

Once at the venue, it proved extremely difficult to ask participants to fill in a questionnaire, although questionnaires were prepared in advance. The average dwell time for the activities was around 3 minutes, and to fill in a questionnaire took a similar amount of time.

### 2.1. Ethical issues

Ethical approval for the project was granted by the University of the West of England, Bristol after the submission of appropriate procedural details to the relevant Ethics committee. Participant anonymity was maintained throughout the data collection and analysis phases, and the interview participants provided informed consent prior to participating.

## 3. Metrics

In total 137 stickers were given to members of the public during the busking at the Trafford Centre, indicating that at least this number of people was actively engaged with the activities for more than 3 minutes. However, this number is an underestimation, since not all researchers did remember to give stickers. From the headcounts done during the observations periods there were 250 people observing/engaging with these activities. The observations were only limited periods (3x 15 minutes each) and the busking took place during 3 hours. Expanding these numbers across the entire time to get an 'average, the number of people engaged with the activities comes to a total of 1000, a high number for a 3h period, showing how successful 'Roaming Robots' was.



**Figure 2.** 'Roaming Robots', at the MOSI: a family engaging with Pleo. Robot Nobot activity can be seen on the very left of the image.



**Figure 3.** 'Roaming Robots', at the Trafford Centre: members of the public engaging with E-pucks, Optobots and BigFoot.



## 4. Observation results

From the observation notes it is possible to say that there was a range of different ethnic background amongst members of the audience, as well as extremely wide age range (toddlers to grandparents). The dwell time was, for the vast majority, up to 5 minutes, with some members of the public staying for more time. It was difficult to monitor dwell time with just one person in charge of the observations.

The venue and the location in particular were always busy, with huge numbers of passers by. The activity happened during half term, therefore the shopping centre was very busy. There was a show happening on the stage on the floor below, which was using an amplifier. As a result, the location was a bit noisy at times.

Key highlight from the scheduled observations are summarised in Table I.

**Table I – Key observation highlights.**

<b>Children</b>	<ul style="list-style-type: none"> <li>• Children invited to ‘do’ something stayed for much longer and often ended up doing multiple activities.</li> <li>• Smiling, laughing, and happy faces were frequent in both children and adults.</li> <li>• Some children were jumping with surprise.</li> <li>• Young children got really excited and engaged with the busking: smiled, said wow, asked questions, and wanted to see more.</li> </ul>
<b>Adults</b>	<ul style="list-style-type: none"> <li>• Pointed out to children, encouraging them to go closer and have a look.</li> <li>• Some children wanted to stop, but parents dragged them away.</li> <li>• Adults often watched as intently as children.</li> <li>• Smiling, laughing, and happy faces were frequent in both adults and children.</li> <li>• Some adults asked for more detail (about robots, about WWR).</li> <li>• Adult females were the most inclined to stop, although adult females were also by far the most predominant demographic group.</li> <li>• Some groups asked lots of questions (how does this work, why are you here, specific questions about robots).</li> </ul>
<b>Passers by</b>	<ul style="list-style-type: none"> <li>• Keen to peer around the edge to see what was happening.</li> <li>• Generally very keen to participate.</li> </ul>
<b>Teenagers</b>	<ul style="list-style-type: none"> <li>• Teenagers were more likely to stop for general busking (David Price).</li> </ul>
<b>Other observations</b>	<ul style="list-style-type: none"> <li>• Those merely watching tended to move on.</li> <li>• When the buskers made the effort to bring in new audience ‘volunteers’ it was positively successful.</li> <li>• During some extremely busy periods (high numbers of people in the shopping centre) it was very rare for buskers to approach passers by directly, since the existence of a crowd would attract</li> </ul>

	<p>other passers by.</p> <ul style="list-style-type: none"> <li>• The audience was clearly very engaged with the activities and wanted to see more: some adults and children peeked into the bandstand to see if there were any other activities to do.</li> <li>• Some members of the audience, after engaging with the buskers outside the bandstand went into the bandstand to have a seat and were approached by other buskers, who showed them some robots. These members of the public were very interested in the subject and asked lots of questions. A mother and son even stayed over half an hour.</li> </ul>
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## 5. Staff interviews results

As part of the evaluation process, 4 staff members were interviewed: 3 were involved with the busking activities plus another staff member involved with the organisation of the activity and the busking. Key themes that emerged included:

- **Enjoyment:** all members interviewed enjoyed being involved in the activities. Reasons given for that enjoyment were the fact that they like to catch people's attention, interact and talk with people and getting their work outside of the laboratory. Typical comments included:

*'To be able to capture people's attention and make children think and especially make people smile at the end.'*

*'I love to interact with people and I love showing off the robots.'*

*'It's fun and it's actually good to get my work outside the lab and to communicate with people.'*

- **Motivation:** staff and researchers interviewed like to communicate but they all had different motivations to participate in this activity. More specific motivations included:

*'I find this more engaging then when I was at the hall [at MOSI]. It's a lot more fun to find people and interact with them.'*

*'There's going to be people in here. For me it's really important to get this stuff amongst people, because there is so much wrong thinking about robots.'*

- **Purpose:** in the opinion of the interviewees the purpose of the activity was:

*'The purpose of the event is to capture people's attention and to show them some science tricks and some robots.'*

*'Probably trying to get a different target audience. Show what you are doing and talk to the public and keep them informed.'*

*'For me is that someone amongst these kids will go 'I can do better than that' and go and do it.'*

- **Visitors' reactions:** staff members were very pleased with the audience numbers, reactions and questions and felt participants were very interested and positive. The staff involved also felt it was easy to engage the audience with the activities. Staff also noticed that there were two types of people: the ones that have a quick glance, listen to a few words and walk away, and the ones that would sit and keep listening and playing.

- **Feedback from the audience:**

*'Mostly sort of inquisitive and wondering what it was, what it did, why it did it.'*

*'The ones that are interacting are really interested. I had a group of teenage girls asking questions, which is surprising by itself.'*

*'A lot of people would say thank you and that they really enjoyed talking to me. Some people asked how I got to work with robots.'*

- **Favourite aspect of being involved:** the opportunity to interact with people was the aspect mentioned by all the staff interviewed.

*'Working with really young children. Normally, when I start talking about research people glaze over, but kids are just fascinated.'*

*'Chatting with people about what I do, what I was playing with. Trying to teach something.'*

*'Every time I see young kids interact with the robots. It gives me ideas what I can make different and better.'*

- **Least favourite aspect of being involved:** One interviewee could not point out a least favourite aspect, as he enjoyed it all. Other least favourite aspects mentioned were:

*'I reckon it's slightly in the wrong place, people are rushing past the whole time, so it's a bit frustrating.'*

*'To keep saying the same things over and over again and to be standing up.'*

*'More breaks would be good, it's just tiring.'*

- **Improvement:** members of staff and presenters involved provided the following comments about aspects they thought could be improved:

*'I don't think you can improve, not this one.'*

*'It would be nice to have more tricks available.'*

*'Don't do the activities in the bandstand! It's far easier to attract people when you are outside [the bandstand], you can approach them.'*

- **Future participation:** All members interviewed would like to participate again in similar activities.

## 6. Successes and challenges

### 6.1. Successes

- Participants felt very comfortable while engaging with the activities and with the speakers: they smiled, laughed, they told the roboticists that they have enjoyed (e.g. 'This was great', 'Thank you, I really enjoyed it') and they asked questions. The overall feeling was that they had fun, and had a very active approach to the experience.
- The activity attracted a wide age range of participants (toddlers to grandparents) and there was also a good mix of ethnicities.
- The event engaged a high number of people with physics-related robot busking activities.
- The fact that the activities took place during half term was very positive: from 11am until 4pm the shopping centre was always busy. There was also a high number of children visiting the venue and they were naturally attracted by the robots roaming around.

- The relationship with the venue was very good: the contact with the Events Assistant at the Trafford Centre was always positive and they were able to accommodate our requests. They were also very keen on having the busking activities happening.
- The majority of the researchers involved in the event were able to develop their skills and experience in engaging with the public. They were very keen to participate in similar activities again in the future.
- Researchers involved were very motivated to participate. They felt that communication with the public is crucial.
- Some buskers choose to sit on the floor in order to show the demonstrations to children and to allow them to experiment with the robots. This worked really well, since the children felt comfortable and relaxed and were willing to stay longer.
- The Café Scientifique sessions before and after the busking worked really well with 'Roaming Robots'. The audience had the chance to try different things and children could play with robots while adults would chat with the roboticist.

## **6.2. Challenges**

- Recruitment of researchers: the number of roboticists attending the Festival of Robotics was lower than expected. As a result, fewer were able to participate in the activity than originally anticipated.
- There was a show happening on the stage on the floor below, using an amplifier, which led to background noise. This was a minor problem at some moments.
- Having a couple more volunteers would have been good, since the researchers involved didn't have many chances to have breaks.
- More busking activities would also improve the event, from the perspective of the researchers involved. However, the purpose was for researchers to busking with their robots/equipment. Therefore, the number of activities is related to the small number of recruited researchers.

## **7. Conclusions**

The busking activities fitted very well with the venue and audience. Although the public was not expecting science-related activities in a shopping centre, they were generally very keen to stop and participate. Especially, parents and grandparents gave great encouragement to children, they wanted them to participate and experiment.

The project did meet its overall aim of engaging people using physics related activities and the event was a major success. The team presented 2 days of busking, one in a more formal venue (a museum) and another day in a non-traditional venue (a shopping centre). The activity engaged at least 1000 local participants with science and key physics concepts, which was a much higher number than we expected (and that was stated as one of the project's objectives). From that total number of participants, at least 137 were actively engaged with the demonstrations and activities. The event also allowed 7 researchers to develop their skills delivering entertaining and informative demonstrations.

The evaluation shows that the event was overall very successful and was able to engage with a high number of members of the public, who were very pleased with it. Target numbers were

significantly exceeded, the venue was very busy and the audience was interested in the activities. The levels of engagement experienced by participants were generally very high. Although some people were obviously in a rush, there is a great potential for success for such events.

The key elements for the success of Roaming Robots were:

1. **Audience:** The Trafford Centre was an ideal 'generic venue' to take physics/robotics directly to where the audience was naturally present and where they felt comfortable. The audience was open minded and wanted to try new things.
2. **Location:** The stall was located in an area where there were high numbers of passers by. Although there was some noise, the levels were appropriate to encourage conversation.
3. **Team:** The team members were very important to the success of the activity. They were committed, friendly, enthusiastic and flexible. They also had good scientific understanding and enjoyed talking to the public.
4. **Busking activities:** The demonstrations were presented in an appealing and engaging manner and attracted the audience.

## 8. Budget

The amount awarded by the IoP was £764 and our total expenditure was £538. There was an under spend of £226 since several costs were reduced. For example, there were no costs associated with the transportation of the roboticists and equipment, since a hired car was used (paid by WWR).

# APPENDIX I - Observation Schedule

Location: \_\_\_\_\_

Date: \_\_\_\_\_ Time: \_\_\_\_\_

Record the following observations over a 10-15 minute time window:

<p><b>General Problems?</b> (accessibility, logistics, weather, scheduling, etc)</p>		
<p><b>Audience Males</b></p>		
<p><b>Audience Females</b></p>		
<p><b>Audience Type</b> (size of groups, multi-generational, age range?)</p>		
<p><b>Staff delivering the activity:</b> (Age, appearance, confidence, enthusiasm)</p>		
<p><b>Activity Type:</b>  <b>How long does the activity take?</b></p>		
<p><b>Engagement:</b>  (How were they attracted to the venue? Do they get involved or just observe? (watching, asking questions, touching equipment, taking brochures))</p>		
<p><b>Dwell time:</b> (How long are they staying?)</p>		
<p><b>Group dynamics</b>  Are they talking to each other? Is conversation about the activity? Are they working together or as individuals?</p>		
<p><b>Comments made or questions asked:</b> (lecture / discussion?)</p>		

## **APPENDIX II - Staff Interview Schedule**

Thank you very much for agreeing to participate in this interview. It won't take very long and I'd appreciate it if you could be as honest as possible regarding what you think about this activity.

**1. Did you enjoy participating in this activity?**

Why?

**2. What motivated you to participate in this event?**

**3. What did you think was the purpose of the event?**

**4. How did the visitors respond?**

**5. How easy or difficult was it to engage the audience in this activity?**

**6. What was your favourite aspect of being involved in the activity?**

**7. What was your least favourite aspect of being involved in this activity?**

**8. What sort of feedback did you get from the audience?**

e.g. did any of them approach you with questions or comments?

**9. How would you improve this activity?**

**10. Would you like to participate in a similar event again in the future?**

Thanks very much for participating.