

# Using Street-Performance Style Robot Comedians To Attract Audiences For HRI Studies

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**Abstract**—Robot comedy can be used to explore the interaction behavior of robots as perceived by the audience. Conducting human studies through robot comedy can be difficult as multiple shows are required and the traditional performances on stages can be expensive and pose difficulty in recruiting audiences and collecting data about different aspects of the performance. These difficulties are further increased with the presence of multiple robots. This paper introduces a street style performance for multiple robot comedians to run Human-Robot Interaction (HRI) studies. The street style performance proposes the following strategies : (1) Self-Recruitment of the audience by the robot comedians (2) Having multiple robots act out scenes relevant to HRI concepts (3) Data collection to increase audience involvement and investigate audience response during the show

## I. INTRODUCTION

Integrating humor into robots has been shown to increase feelings of camaraderie and teamwork in HRI [5]. Moreover, people’s fascination with computational humor has been demonstrated via automated scriptwriting and computer-generated puns [6]. This paper builds on previous efforts to use robot comedy to conduct user experiments [4][3][10]. However, where previous studies used single comedians and more traditional recruitment tools, this work utilizes street-performance style strategies to (1) recruit their own audiences in public settings, (2) collect data relevant to HRI interactions by acting out comedy bits between two robots, and (3) a data collection structure for increased audience involvement and easy investigation of audience’s response.

Robot comedy is a useful backdrop for conducting interaction studies. The performance structure for stand-up comedy, in particular, is highly flexible. Given its pre-planned structure and clear punchlines, it allows one to structurally collect feedback from the audience. In this work, we specifically **innovate audience data-collection** during HRI studies by asking human audiences to raise their hands in response to robot queries. This allows both explicit and implicit data from the audience to be collected.

To conduct interaction studies, two or more agents are required to interact as a part of a comedy performance. The audience can provide valuable data on how they perceive this interaction. These results facilitate designing social robots that are capable of good interactive behaviors and practices. Our first trial involved using a human co-performer, the first author, to perform with the robot. This allowed the authors to experience the field of robot comedy and get a sense of the



Fig. 1. A robot team performing stand-up comedy together to explore the duo comedy structures and explore the space of robot comedy to conduct interaction studies.

space. The human-robot performances provided an opportunity to explore the duo comedy structures. After a successful performance by the human-robot team, to understand robot-robot interaction and have a repeatable performance, our next question was, Could a robot-robot comedian team be used to conduct interaction studies? A pilot study was conducted at the local Farmers’ market where two robot comedians ran interaction studies in-the-wild with a self-recruited audience as shown in Figure 1. This pilot study led to our actual study described in this paper which proposes a street-style multi-robot comedy structure. The actual study illustrates a team of two robots conducting their own user studies to explore relational humor at the Da Vinci Days Summer festival [1].

## II. BLOSSOM ROBOTS

We utilized a low-cost Blossom robot platform to increase the repeatability of this work, and the accessibility of robot comedy. Blossom robots are social robots designed by the social robotics group at Cornell aimed to provide flexibility and accessibility [8]. These small robots are cheap, minimal, and provide flexibility in adapting to different applications. For robot comedy, an online text-to-speech (TTS) platform was used to give a voice to these robots [2]. These Blossom robots come with a set of predefined gestures that can be adopted, and provide flexibility to create custom gestures [7]. A combination of both types of gestures was used for the study in this paper.



Fig. 2. Portable robot comedy platform made of inexpensive, flexible, and portable Blossom robots set up to self-recruit audience from festivals.

### III. STREET PERFORMANCE INSPIRED STUDY DESIGN

This section describes our approach to recruit audience, our methods to use multi-robot set-up to run interaction studies, and our approaches to elicit audience involvement and collect data.

#### A. Recruitment

Conducting human studies requires an audience for both the good and not-so-good shows. Recruiting a decent amount of audience for all the shows in the standard format of a stage-based show is difficult and expensive. To facilitate easier setup to conduct interaction studies, a portable multi-robot comedy structure was developed. The Blossom robots along with a puppet theatre are used as the setup. The robots along with their stage can move around and reach the audience more easily by performing in different places. The robots had posters attached advertising information for the next shows to recruit the audience. This portable set up of multi-robot comedy provides a lot of advantages:

- Increased reachability - Robots can reach more people easily as they can now perform at various festivals and exhibitions to collect data.
- Scalability - The robots are inexpensive and allow code reusability and can, therefore, be scaled to a large group of robots easily.
- Repeatability - These robots have minimal chances of failure and are easy to fix allowing repeatable performances.

The robots performed at the Da Vinci Days Summer festival using the portable multi-robot comedy structure, as shown in Figure 2. The team of robots performed for the self recruited audience and conducted a user study to explore relational humor.

#### B. Multi-Robot interaction studies

Running interaction studies require two or more agents. Multi-robot comedy can make use of the comedy platform to run interaction studies and collect audience feedback on interaction behaviors. During the study, the robots played the role of two comedians who act out scenes with HRI concepts

Topic of the joke bit	Pirates Joke
Short Introduction	P2: If you just got here, I'm Fungi, and this is Baby Blue and we are ROBOT COMEDY
Joke	P1: I ran into a pirate in Newport last weekend with a hooked hand, and an eyepatch. P2: You said he lost his eye? P1: Yeah, a seagull pooped in it. P2: Why would he lose his eye from that? P1: It was the first day with his hook.
First comment by the co-performer about the joke positively	P2: Ha, that was an awesome joke
Second comment by the performer disagreeing with the co-performer	P1: No, that was terrible.
Co-performer querying the audience for data collection	P2: Let's ask the audience. Raise your hand if you guys thought that was awful. Raise your hand if you think that was awesome.

Fig. 3. A conversation-like script for two robot performers P1 and P2 to act out HRI concepts and collect data from the audience after every joke bit.

by using a conversation-like comedy script as shown in Figure 3, and make comments about each other. This allows the robots to act out the different variations of the interactions and collect data from the audience on how they perceived it.

#### C. Data Collection

Data collection is an important aspect of running user studies. Qualitative data collection methods like surveys, interviews, and other standards questionnaires like Godspeed are often used to collect data. These methods are tedious and require the audience to spend additional time apart from the performances. They are only feasible in traditional stages where the audience is more organized. Furthermore, these methods may not be effective as they cause the audience to evaluate and form opinions only at the end of the performance instead of throughout the performance. Specifically, audience members may forget to report observations and opinions at the end.

To avoid this, a revised method that allows data collection amid the show with no human involvement is proposed. During the performance when the audience's feedback or data is required, the robots pose a question. This question is incorporated into the performance as shown in Figure 3. The audience is then asked to give a response by doing a simple action like raising hands, giving a thumbs up, or any method that requires no external props. These responses are easy to articulate making the data collection process efficient and effective. Additionally, the data collection happens multiple times during a performance instead of a single time in the end. This means audience members who do not stay back for an entire performance can still contribute.

### IV. ASSESSMENT OF STREET PERFORMANCE METHOD

A full description of the experimental results is available in our work [9], however, this document focuses on the participation results relative to our three street-performance inspired themes.

The robot duo self-recruited audience for 12 shows within a span of seven hours with no human involvement for the user

study using the street-style performance structure. The robots acted out scenes to test the audience’s opinion on relational humor mainly focusing on the sensitivity of the audience to the butt-of-the joke. The robots made a positive or a negative comment on the joke, the robot partner, or the audience. These manipulations of the variables were done by the conversation-based script multiple times in a single show. After every manipulation, audience data was collected. The robots self-collected 262 unique responses on relational humor with a self-recruited audience through just 12 shows within a span of seven hours. This shows that the street-style performance can provide a strategy to recruit audiences, have multiple robots act out interaction concepts, and collect data multiple times during the show itself.

## V. DISCUSSION

The street-style performance structure overcomes the disadvantage of having to recruit audience members and instead goes to the audience’s space to run user studies. It allows easy manipulation of variables to test interaction concepts and a poll-based data collection structure imbibed in the show that allows easy collection of audience data multiple times during the show.

This study also resulted in the identification of gaps in running user studies using a multi-robot comedy platform. Implementing and programming gestures for robots that coordinate with the dialogue is hard, especially for a large number of shows. Additionally, the gestures might lack consistency across different shows. This problem grows exponentially with an increase in the number of robots. This led to our next project of building an automatic gesture generator for multiple robot comedians based on a script. The gesture generator will provide a list of coordinated gestures for the multiple robots based on the script by extracting the four major categories (1) Punctuation, (2) Co-performers, (3) Sentiments, and (4) Opinions. These four categories of gestures were determined based on the author’s prior experience programming the gestures manually. However, to get a generic set of gestures that the robot should use while performing, it is important to understand how human stand-up comedians use gestures in their performances. Thus, to determine which gestures are to be mapped for what dialogue, a study is in the process to annotate the gestures of human stand-up comedians. A list of twenty comedians has been selected based on the view counts of their recorded videos. Once the annotation is complete, the authors will extract major themes and implement them to make an updated gesture generator system.

## VI. CONCLUSION

This paper investigates the utility of using street performance style robot comedy performance as a backdrop for HRI studies. While we are not the first people to use robot comedy in HRI studies, the emphasis of this work is on three concepts that were specifically enabled by this approach: (1) Self-recruitment of an audience, (2) Testing interaction concepts by having multiple robots act it out, and (3) Data collection

process to increase audience involvement and elicit audience’s response. We encourage future researchers to take advantage of the street-style methods for recruiting bystanders. It works well for entertaining interaction problems. For example, we would also be interested in utilizing these methods for a snack distribution service robot, or other styles of performing arts robots.

The companion video to this document also describes our ongoing work after the conclusion of the street performance style investigation to build a model of gestures used by human stand-up comedians and use this model to develop an automated gesture generator for multiple robot comedians based on a script. As a result, with a single input script, an entire multi-robot comedy performance can be achieved.

## REFERENCES

- [1] Da Vinci days Summer Art and Technology Festival, Corvallis. <https://www.davincidays.org/>. Accessed: 2019-09-15.
- [2] Natural Readers for text to speech. <https://www.naturalreaders.com/online/>. Accessed: 2019-07-19.
- [3] Kleomenis Katevas, Patrick GT Healey, and Matthew Tobias Harris. Robot comedy lab: experimenting with the social dynamics of live performance. *Frontiers in psychology*, 6:1253, 2015.
- [4] Heather Knight, Scott Satkin, Varun Ramakrishna, and Santosh Divvala. A savvy robot standup comic: Online learning through audience tracking. In *Workshop paper (TEI’10)*, 2011.
- [5] Anton Nijholt, Andreea I Niculescu, Valitutti Alessandro, and Rafael E Banchs. Humor in human-computer interaction: a short survey. 2017.
- [6] Jonas Sjöbergh and Kenji Araki. A complete and modestly funny system for generating and performing japanese stand-up comedy. In *Coling 2008: Companion volume: Posters*, pages 111–114, 2008.
- [7] Michael Suguitan and Guy Hoffman. Blossom: a tensile social robot design with a handcrafted shell. In *Companion of the 2018 ACM/IEEE International Conference on Human-Robot Interaction*, pages 383–383. ACM, 2018.
- [8] Michael Suguitan and Guy Hoffman. Blossom: A handcrafted open-source robot. *ACM Transactions on Human-Robot Interaction (THRI)*, 8(1):1–27, 2019.
- [9] Janani Swaminathan, Jane Akintoye, and Heather Knight. Portable Robot Comedy: Bringing Experiments to their Participants. Submitted for Review to Proceedings of the 2020 IEEE/RSJ International Conference on Intelligent Robots and Systems· IROS (Under Review).
- [10] John Vilks and Naomi T Fitter. Comedians in cafes getting data: Evaluating timing and adaptivity in real-world robot comedy performance. In *Proceedings of the 2020 ACM/IEEE International Conference on Human-Robot Interaction*, pages 223–231, 2020.