

# Dona: Urban Donation Motivating Robot

Min Su Kim<sup>1</sup>, Byung Keun Cha<sup>2</sup>, Dong Min Park<sup>1</sup>, Sae Mee Lee<sup>3</sup>, Sonya Kwak<sup>4</sup>, Min Kyung Lee<sup>5</sup>

<sup>1</sup>Industrial Design Dept.  
School of Design  
Hong Ik University  
Seoul, South Korea  
thisisminsu@gmail.com  
illudesign@naver.com

<sup>2</sup>C.A.C. Group  
HAC C&D Lab.  
LG electronics  
Seoul, South Korea  
Solitardj9@hotmail.com

<sup>3</sup>Industrial Design  
School of Design&Art  
Yonsei University  
Seoul, South Korea  
Meemotioner@gmail.com

<sup>4</sup>Industrial Design Dept.  
KAIST  
Daejeon, South Korea  
sonz@kaist.ac.kr

<sup>5</sup>HCI Institute  
Carnegie Mellon Univ.  
Pittsburgh, USA  
mklee@cs.cmu.edu

**Abstract**— The rate of donations made by individuals is relatively low in Korea when compared to other developed countries. To address this problem, we propose the DONA, an urban donation motivating robot prototype. The robot roams around in a public space and solicits donation from passers-by by engaging them through a pet like interaction. In this paper, we present the prototype of the robot and our design process.

**Keywords** - donation, charity, human-robot interaction, interaction design, emotion, pet-like interaction, ludic experience

## I. INTRODUCTION

Donation is an important economical and social activity that benefits non-profit organizations and socially isolated population. Despite this importance, the culture of donation has not been yet established in South Korea. For example, the percentage of donations made by individuals was only 16% in 2006, which is significantly lower than those of other developed countries [3]. This is problematic as the rate of donations made by individuals is an indicator of how widely the donation culture is adopted.

As one way to promote individual donations in Korea, we propose the DONA, a robot that interactively solicits donation from passers-by (Figure 1). The robot roams around in a public outdoor space and solicits donation from passers-by by engaging them through pet-like interaction.

In devising this concept, we considered the following design goals. First, we sought to leverage people's natural, spontaneous throwing behaviors to motivate donation. Our personal observations in a public place show that people tend to throw coins at the center of a pond or a water fountain as this behavior is inherently engaging. The DONA robot allows people to put their cash in the can that the robot is holding, and ideally catches coins that people throw at it. Second, we aimed to provide emotional feedback in response to people's donation. The robot is in a cute, non-threatening form. The robot engages passers-by moving its head side and roaming around, and thanks them by nodding its head.

## II. ROBOT PROTOTYPE OVERVIEW

The current DONA prototype is 38 cm tall, and 24 cm wide, and consists of three parts - a main body with the head, a can for collecting money, and a base for navigation.



Figure 1. A photo of the Dona prototype. The robot roams around in a public outdoor place and solicits donation from passers-by.

The internal hardware structure was built using iron bars, plates, and elastic plastic. The robot has three servo motors which enable it to look around and bow to people. We programmed simple head and navigation movement using Arduino, an open-source electronics prototyping platform [1]. We used soft knit fabrics as an outer housing. The housing can be replaced easily with other materials and forms.

An ultrasonic sensor is placed in front of the robot's can so that it detects objects moving within the range of 50 cm. If the robot senses obstacles, it stops for a while and starts to bow its head appealing for people to make donations. The current prototype does not distinguish a person from an object, and the implementation of person detection will be future work. The robot's route is predetermined so that the robot does not hit the wall. We describe the robot's interaction sequences below. For a better description, please refer the demo movie submitted with the paper.

- The robot roams around as programmed in a public area.

- A passer-by approaches the robot, and comes within the range of 50 cm from the robot.
- The ultrasonic sensor detects the person and sends a signal to the mainboard.
- The robot keeps nodding its head to the person in order to attract his/her attention.
- The person throws coins into the can and leaves.
- The robot thanks the person and goes on its way again until it finds a new donator.

### III. DESIGN PROCESS

The design process involved ideation through brainstorming, concept generation through sketching and prototyping.

#### A. Ideation for Robotic Applications

The ideation phase first took place during the Sharing Experience'09 Workshop [2]. To get unbounded, creative ideas on the areas where robots can be helpful, the workshop participants went outside and took photos of things that have interactive input and output components. Using these photos as probes, we generated a wide range of ideas. The ideas widely ranged from extremely blue-sky (e.g., artist robot in the street) to fairly practical application (e.g., a porter robot). Among the variety of the concepts, the idea of the donation motivating robot was chosen as there has not been a similar robot concept to our knowledge, and also contributes to public benefit.

#### B. Concept Generation

In the concept generation phase, we focused on different ways to motivate donation from passers-by in a public place. The final concept arose from two interaction ideas, pet like interaction that provides emotional feedback to people, and interaction that leverages people's natural throwing behaviors (Figure 2).



Figure 2. Two initial concept sketches and prototypes

The first idea uses a cat like form, and uses cats' rubbing and eating behaviors. The second idea uses a can shape where people can easily throw coins to the robot. Our final concept combined these two factors: it has a cute, life-like form and holds a can.

#### C. Preliminary User Study

We conducted two preliminary user studies in order to understand people's initial reaction to the robot between December 12<sup>th</sup> and 14<sup>th</sup>. The studies took place in a subway station and a public plaza. The money collected during the studies was donated to a charity organization. While the results are extremely preliminary, we learned that several things. First, the robot successfully caught people's attention and enticed them to donate money. Second, we learned that the robot could assist existing charity organizations and human fundraisers.



Figure 3. The DONA prototype interacting with passers-by in a subway station

### IV. FUTURE WORK

We are currently analyzing research data from an initial user study. Based on the result, we will build a more refined prototype using soft silicone over a durable structure. Our future research will assess the success of design relative to our design goals through field trials with charity organizations.

#### ACKNOWLEDGMENT

We gratefully acknowledge the support of 'Sharing Experience 2009' hosted by MIT Media Lab, and thank Dong Yun Park, Jun Bin Lee, Pil Sung Lee, and Ji Myung Kim, the participants of the Designing for Robotic Services workshop.

#### REFERENCES

- [1] Arduino, <http://www.arduino.cc/>
- [2] Sharing experience'09 website, <http://www.workshopseoul.com/index.php>
- [3] 한국기부문화는 전시용 (Korean donation culture is to only show off.).September 2007, Hankook Ilbo, <http://news.hankooki.com/lpage/society/200709/h2007090219220621950.htm>