
Ritchie the DeskBuddy: 3D Printed Robot Avatar for Event Reminding

Dhananjai Hariharan
Rochester Institute of
Technology
Rochester, NY 14623, USA
dh1723@rit.edu

Tiago Justino
Rochester institute of
Technology
Rochester, NY, 14623, USA
tvj6825@rit.edu

Abstract

Ritchie The DeskBuddy is a 3D printed robotic tiger that works as an ambient device for reminding and notifying users about events relevant to their life. In this project, we attempt a different approach to combine digital information into a physical object, personified by an avatar. Through the use of such an ambient device, we seek to be able to drive user reaction and to also form an emotional bond with the user. We also aim that such a device can be used to imbibe new habits in users.

Author Keywords

Ambient Device; Tangible Interface; Personification; 3D Printed Robots

ACM Classification Keywords

H.5.2 [Information interfaces and presentation]: User Interfaces

Introduction

There are a wide variety of resources available to people to keep track of events and activities, remind them about these, and to make them more productive. Two approaches are commonly used: 1. using physical reminders such as post-it notes and diaries. The drawback here is that the user is physically constrained. For example if the user has post-it notes at home, these notes aren't accessible when

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than ACM must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from permissions@acm.org.

she is in the library; and 2. using software reminders, such as Google Keep and Google Calendar. Although they are available to use for free, these are easy to ignore as they only exist virtually (only provide simple notifications) and are not reflected sufficiently enough in the physical world.

This project attempts a new approach to this application. What if it were possible for a physical object in a user's space that could draw attention and spark user reaction in a more effective manner? What if there could be an object that can play the role of a friend that reminds a person about the occurrence of an event? Wouldn't it be great if someone were to tell you to stop what you were doing and keep up with your new year resolution of running 5K every-day? Graphical User Interfaces, by their nature, do not create an emotional bond with a user in most interfaces. Having an emotional bond with an object can greatly enhance user experience with that particular object, irrespective of the simplicity of its purpose.

Ritchie the DeskBuddy is just the device for the role. Ritchie is a 3D printed robotic tiger that sits on a user's desk and reminds them of events or activities that need to be done. As an internet-connected device, Ritchie can be of great utility when provided with pertinent data sources. To be clear, Ritchie is not an AI robot. It cannot tell you what you need to do, or tell you about the weather. Nor can it specifically remind you to buy some eggs on your way back home. What Ritchie can do is wave its arms and move around to get your attention about something important. The rest is upto the user to check on the topic of concern. The events can range anything from small everyday events to more important things that demand immediate action.

Related Work

Peek et. al [5] describe *Hangster*, an ambient display that embodies virtual interactions using physical devices hanging on strings. These devices are designed to look like personalized avatars. *Hangster* allows a person to see their friend's status (online/offline) on a messaging application (by lowering/raising the avatar), and allow some simple interactions - e.g. initiate a conversation by gently tugging on the avatar string, show notifications by moving. *Dino*¹ is an ambient display that controls a physical object to react to the nature of conversations on a chat application. By studying the content of the conversation, the 'egg' moves to show whether it is happy, sad, angry or calm. Similarly, *Availabot*² is a computer-controlled push puppet that stands or falls down to reflect a friend's availability (online/offline status) on a chat application.

Jafarinaimi et. al [3] describe *Breakaway*, an ambient display that attempts to encourage people who sit for long periods to take more frequent breaks. This is implemented using a shape-changing artistic sculpture object. User's position and posture is tracked using various sensors. Shape and movement of the device reflects the user's pose - upright when the user takes a break, and slouching when the person has been sitting for extended periods. Similar to *Breakaway*, *MoveLamp* [1] keeps track of a person's physical activity at the workplace and attempts to encourage physical activity when a person has been sitting for long periods. This made use of a pedometer application on a smartphone, in combination with software on a computer to control an ambient lamp that changed color from green to red to make the user aware that they need to move. Rogers et. al [6] investigated whether ambient displays

¹Dino - Ambient Display Creature: <https://www.youtube.com/watch?v=AvST9wjrkC4>

²Availabot: <https://www.youtube.com/watch?v=w0voYnEjFcQ>



Figure 1: Android toy that will be used to inspire Ritchie's design.

can be used to influence behavioral changes among people. In this study, they installed twinkly lights in the carpets to unconsciously guide people to take the stairs. A large ambient display in the common area was used to visualize the number of people using the stairs vs. those that chose to use the elevator. While each of these were implemented differently, they shared a common goal of nudging a user towards an action and observing common behavioral changes over extended periods of time.

In *Tangible Bits* [2], Hiroshi Ishii proposes the concept of coupling the digital world (bits of information) into a physical object, thereby making it 'tangible'. In line with this concept, Ritchie The DeskBuddy would be a Tangible Bit, where the object would mirror digital information and events, acting as a 'phicon', or a physical icon. *ReaDIYmate*³ is a commercially available DIY (Do-It-Yourself) kit for building internet-connected paper objects that react to events in the digital world. Similarly, few other devices exist that physically react to digital events and interactions - *Olly*⁴ is a device that releases a scent for certain digital events/interactions. Similarly, *Polly*⁵ is a device that releases a ball of candy for certain digital events/interactions.

Besides the above mentioned research and projects, there is sufficient work in the area of 3D printed robots and robot parts[4, 7]^{6,7}, as well as numerous resources for accessing 3D models of robots and parts for 3D printing.

³ReaDIYmate: <http://readiymate.com/>

⁴Olly: <http://www.ollyfactory.com/>

⁵Polly project: <http://www.ollyfactory.com/polly/>

⁶Instructables page: "GearBot: A Dual-speed, Gear-driven robot": <http://www.instructables.com/id/GearBot-A-Dual-Speed-Gear-Driven-Bot/?ALLSTEPS>

⁷Cubify - Commercial 3D printed parts for custom designed robots: <http://cubify.com/store/mrn>

Project Description

Ritchie The DeskBuddy is a 3D printed robotic tiger that sits on a user's desk and reminds them of events or activities that need to be done. Figure 1 shows an Android toy that will be used as reference for Ritchie's design.

Information Displayed

The device would reflect reminders, events and tasks relevant to a user. The same concept can be used to developing and practicing some new habits as well, e.g. reading one chapter of a book everyday, running 5K, practice sketching etc.

Data Source

For this project, Google Calendar⁸ will be used as the data source, as it is already widely used by many users as an application for recording activities and keeping track of events.

Device abilities

The 3D printed robot will be able to do the following:

- Perform a waving action (arm movement);
- Move on a flat surface (walk/drive);
- Play certain sounds for certain events;
- Blink lights to attract attention.

Mapping of information to visualization

The robot will be made to wave its arms when a **regular event** occurs. A user can acknowledge this by simply tapping it. For events that occur over long periods of time, the robot will repeat this behavior as a gentle reminder, after

⁸Google Calendar API: <https://developers.google.com/google-apps/calendar/>

a certain time period. When an **important event** is about to occur, the robot will wave its arms and run around in a circle, while making some sounds so as to draw attention. Events flagged as **tasks** or **habits**, will be shown through similar device behavior. A user can register task completion by lifting and shaking the robot, before placing it back. The robot will respond by playing a sound to acknowledge this. For each of these event scenarios, different light patterns will also be used to enhance the visual effect.

Components

The following components will be used to build Ritchie the DeskBuddy:

- Particle Photon;
- 1200mAh Lithium battery;
- Photon battery shield;
- Continuous Rotation Micro Servo (x1);
- 180deg rotation Micro Servo (x1);
- Accelerometer;
- Piezoelectric speaker;
- LEDs.

Implementation Steps

The following steps will be taken for the development of this project:

- Study Google Calendar API:
 - Authenticate to google calendar;

- Get list of events from google calendar;
- Access google calendar API from Photon;
- Prototype robot abilities (breadboard):
 - Use continuous motor with photon;
- Prototype robot movement with continuous motor;
- Prototype arms movement with servo motor;
- Design and 3D print robot case;
- Assemble robot;
- Prepare demo;
- Record and edit video;
- Write final report.

REFERENCES

1. Jens Fortmann, Tim Claudius Stratmann, Susanne Boll, Benjamin Poppinga, and Wilko Heuten. 2013. Make me move at work! An ambient light display to increase physical activity. In *Pervasive Computing Technologies for Healthcare (PervasiveHealth), 2013 7th International Conference on*. IEEE, 274–277.
2. Hiroshi Ishii and Brygg Ullmer. 1997. Tangible bits: towards seamless interfaces between people, bits and atoms. In *Proceedings of the ACM SIGCHI Conference on Human factors in computing systems*. ACM, 234–241.
3. Nassim Jafarinaimi, Jodi Forlizzi, Amy Hurst, and John Zimmerman. 2005. Breakaway: an ambient display designed to change human behavior. In *CHI'05 extended abstracts on Human factors in computing systems*. ACM, 1945–1948.

4. Vittorio Megaro, Bernhard Thomaszewski, Maurizio Nitti, Otmar Hilliges, Markus Gross, and Stelian Coros. 2015. Interactive design of 3D-printable robotic creatures. *ACM Transactions on Graphics (TOG)* 34, 6 (2015), 216.
5. Nadya Peek, David Pitman, and others. 2009. Hangsters: tangible peripheral interactive avatars for instant messaging. In *Proceedings of the 3rd International Conference on Tangible and Embedded Interaction*. ACM, 25–26.
6. Yvonne Rogers, William R Hazlewood, Paul Marshall, Nick Dalton, and Susanna Hertrich. 2010. Ambient influence: Can twinkly lights lure and abstract representations trigger behavioral change?. In *Proceedings of the 12th ACM international conference on Ubiquitous computing*. ACM, 261–270.
7. Adriana Schulz, Cynthia Sung, Andrew Spielberg, Wei Zhao, Yu Cheng, Ankur Mehta, Eitan Grinspun, Daniela Rus, and Wojciech Matusik. 2015. Interactive robogami: data-driven design for 3D print and fold robots with ground locomotion. In *SIGGRAPH 2015: Studio*. ACM, 1.