

SnuggleBot: A Simple Cuddly Companion Robot Prototype

Loneliness is becoming an increasing problem, which has been exacerbated by the widespread isolation associated with the current global pandemic. Social robotics research has shown the potential of robots to improve the mood and wellness of people. However, existing approaches to social robots require heavy technical resources. In this short paper, we present our approach to designing a cuddly companion robot, which reduces the technical requirements of the robot while still providing support to the user.

INTRODUCTION

Loneliness and related feelings are becoming increasingly widespread concerns [3], particularly during the current pandemic [2]. Social robots are one technical solution that have been developed to help with loneliness. Social robots are robots that have features similar to humans or animals and that communicate in life-like ways such as speech, facial expressions, or synthetic emotions. Social robots have shown potential to help people, and research has shown simple designs can improve wellness, increase exercise motivation [4], and increase engagement in education in children [6]. Many commercial social robots have taken a technical approach to solving the problem of how to get people to bond with the robot. For example, the PARO robot uses advanced AI, sensors, and behavior [8]. In this short paper, we present our design of a cuddly robot which reduces the technical requirements of the robot through interaction design. Our design approach has three goals guided by wellness research: the robot should be physically comforting, socially engaging, and require care.

PHYSICALLY COMFORTING

SnuggleBot is designed to provide physical comfort to the user. Physical comfort is a design goal that provides support to the user with no additional technical requirements. To provide physical comfort, the robot is constructed from a stuffed animal with soft fur. Modifications were made to the stuffed animal to increase the comfort level even further. Weighted beads were added to make the robot feel more satisfying to hold, like a

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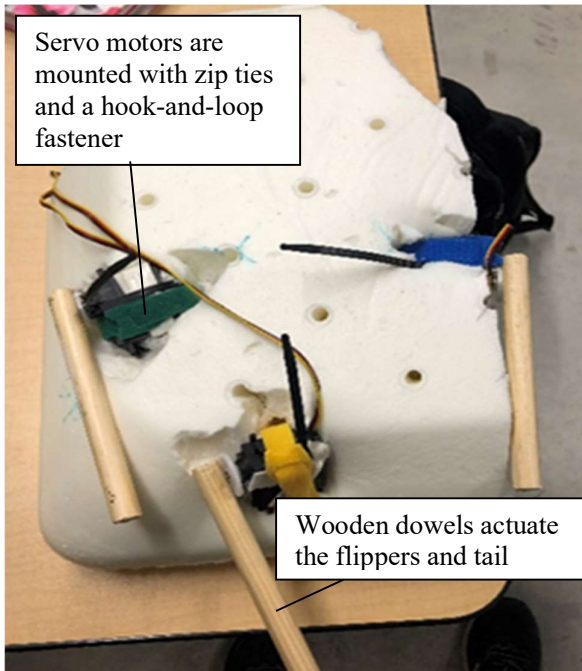
Figure 1. A person cuddles with SnuggleBot

weighted blanket. A pouch was added to the robot to hold a heating pad to provide warmth to the user when they



Figure 2. A person inserts a heat pack into the pouch

cuddle with the robot. Memory foam was used on the interior as a solution to keep the motors in place while still maintaining a soft feel to the robot when it is hugged. Additional padding was placed around the motors so that the robot is entirely soft.



Servo motors are mounted with zip ties and a hook-and-loop fastener

Wooden dowels actuate the flippers and tail

Figure 3. The interior components are mounted in soft foam so that the robot is comfortable to hold and hug

SOCIALLY ENGAGING

SnuggleBot has simple behaviour designed to catch the attention of the user and encourage continued interaction without complex actuators or software. We designed the robot to flap its arms when it wants a hug as people pay more attention to robots that use gestures [7]. The robot also wags its tail to show happiness when it receives a hug, and to show people that it would like more hugs in the future. To communicate with the user without requiring complicated hardware and software for speech, the robot has a horn which changes colour depending on its needs.

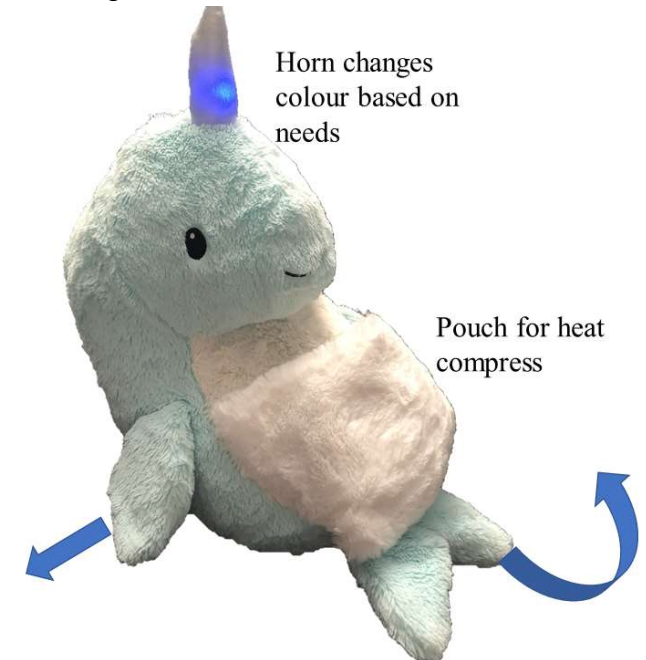
REQUIRES CARE

SnuggleBot needs to be taken care of. We hope that caring for the robot will have similar benefits to caring for a pet, which creates a sense of companionship between the pet owner and their pet [1], and has been shown to increase the wellbeing [5] of pet owners and provide them with a sense of purpose and structure in their lives [1]. Thus, requiring the person to care for the robot



Figure 4. In addition to making the robot feel comfortable to hold, the embroidered heat pack reminds people what the horn colours mean

allows a bond to be formed without requiring complex technical solutions. We chose ways to care for SnuggleBot that would require minimal technology: people need to keep it warm, give it hugs, and charge its battery. For example, to keep it warm, people need to microwave and insert the heating pad. Microwaving the heating pad allows people to care for the robot while the warmth of the pad also makes the robot more comfortable to hold. The only technology required for this interaction was a temperature sensor. We hope that our other design goals will encourage empathy and attachment to the robot and will motivate people to care about the robot's needs. If the robot needs a hug, gets cold, or needs its battery charged, the LED in its horn will change colour to communicate this.



Horn changes colour based on needs

Pouch for heat compress

Figure 5. SnuggleBot's flippers and tail are actuated, and the robot has a glowing horn and a pouch for a heat compress

CONCLUSION

We present our cuddly companion robot design which has three design features aimed to be helpful to people while minimizing technical requirements. Our robot is physically comforting, socially engaging, and requires care.

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