

# Bonnie: Developing a Very Special Friend

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**Demo:** We will show our prototype skeleton for a social robot that is suitable for therapy with hospitalized children. This demo will concern one construction with 3 main components: the main body, the interface (sensory and human control) and the firmware.

**Keywords:** social robot, therapy, Arduino, sensory stimulation, ARCAROS

## CONCEPT

The concept of Bonnie is based on the endearing effect of baby orangutans. The embracing/clinging of a monkey triggers a sense of care and an impulse to hold it close. To avoid an uncanny design [1], we chose not to create a human baby, but an animalistic form that still had some of the appeal of a human. An orangutan is more exotic and would raise less high expectancies.

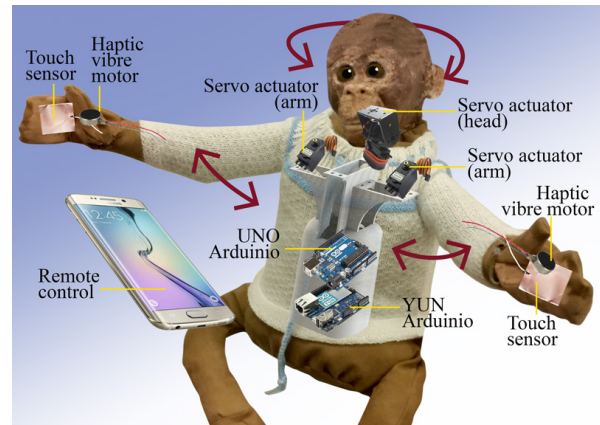
Based on interviews with caregivers in a children's hospital we chose the following basic functionalities:

- Head can move sideways.
- Head can move up and down.
- Hands with grip.
- Haptic touch sense (vibrating hand).
- Arms can embrace.
- Remotely adjustable behaviour.
- Inclusion of sound effects. This needs more investigation.

## INTERACTION SCENARIO'S

To enable the arrangement all the actuators in the desired disposition we produced a 3d printed body which also houses all the electronic components and batteries (Figure 1). The objective of this prototype is to trigger a 'sense of care' and combine the functionalities in meaningful scenarios, such as:

- Child touches the robot and triggers a corresponding movement. For example:
  - o A touch triggers a hug.
  - o Touching the belly triggers an approving nod.
  - o Squeezing the hand will make it vibrate. This vibration will serve as a pain relief when a child is punctured, similar to the effect of the buzzy[2].
  - o Touching Bonnie triggers a sound effect.
- Hands with grip, triggered by a touch sensor in the palm.



**Figure 1.** Bonnie augmented with sensors, actuators and Arduino's. Degree of freedom: saying *no* or *yes* and *hugging*. Not shown: pressure sensor (belly) and sound generator.

## FIRMWARE

The system is controlled by a centralized firmware. Its architecture is based on isolated blocs that can be added or modified easily without affecting other parts of the system. Moreover, the modules are structured in three layers (application, translation and hardware). This increases the modularity/scalability of the system, forming a platform (ARCAROS) able to create more Bonnie-like robots with others inputs and functionalities.[3]

## REFERENCES

1. Mori, M. (1970/2012), The uncanny valley (K.F. MacDorman & N.Kageki, Trans.). *IEEE Robotics & Automation Magazine*, 19(2), pp.98-100.
2. Baxter, A.L., et al., An integration of vibration and cold relieves venipuncture pain in a pediatric emergency department. *Pediatric emergency care*, 2011. 27(12): pp. 1151-1156.
3. Johnson, B.D., 21st Century Robot. 2014 - chapter 5 The Brain, *Maker Media*, Inc.