CycBot: A Cyclical Soft Robot for Nonverbal Communication with Humans

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Abstract— In this project, we present CycBot – a soft robot designed for nonverbal communication with humans. The robot's design incorporates silicone materials and 3D printing. Our robot was inspired by toys like Furbies and Tamagotchis, aiming to create an engaging interaction experience. We achieved a successful design and fabrication of CycBot, demonstrating its ability to express emotions using soft robotics actuator.

I. INTRODUCTION (∼ %10)

Our robot, CycBot, was designed in Fusion 360 and fabricated using a combination of 3D printing and silicone molding. The robot's body consists of a 3D-printed frame, while the body and ears are made from Ecoflex 00-30 silicone. The robot uses one servo motor to rotate head, three air pumps, and

II. METHODS (∼ %25)

It is always a good idea to write down your methods in detail, with all parameters written down, in a permanent place (e.g., a hard-backed book), while you are still doing the work, and to label all results with which experiment they belong to. Of course, if you will be working on computer, take back-ups seriously. Ideally, your report should contain enough information about the methods used to enable another student/researcher to replicate your experiments. The methods section should concisely describe your design as well as its materials and fabrication. Also specify which control strategy you are using for your robot and in case you are using a bioinspired design or another inspiration, state which animal(s)/character(s) it is inspired by and how. Lastly, describe the methodology of your human-robot interaction (HRI) experiment (procedure, measures/questions posed etc.).

III. RESULTS (∼ %40)

The results section of your report should contain the actual results. No interpretations, no extrapolations, just the (processed) data. Displayed nicely with confidence limits included in some form — error bars, standard deviations, whatever. The description of how you processed your data should be included in either the methods or else the results section. Note that unexpected and outlying results should also be included, especially if they are repeatable. In theory, negative results are just as important as positive results. It is just as scientifically valid and useful to state that this approach to this problem doesn't work, as it is to find an approach that does work. As the project focuses on nonverbal communication in interactions with humans, you should include results of one or more human-robot interaction (HRI) experiments evaluating this communication and demographic data for participants (age, gender, prior robot interaction experience).

IV. DISCUSSION (∼ %20)

The discussion section is where you put your interpretations, extrapolations etc. It normally starts with concrete conclusions that come directly from your data itself, then gradually becomes more abstract as you extrapolate into the future and into broader research areas. You should start concrete, to show people that you are working with fact and not fantasy. But there is no harm in claiming potential greater significance for your results, if justifiable. Go back and check again, that what you have written in your discussion section ties in properly with the results you included in your report. What is the main message that you want readers to take home? Make this the primary focus of your discussion! The rest of the discussion should provide supporting arguments for this, your main thread. Your discussion section could address, e.g., select aspects of the robot's performance compared to the state-of-the-art and results and implications of your HRI experiment(s).

TABLE I
TYPICAL SILICONE-BASED SOFT MATERIALS

	Ecoflex		Elastosil	Sylgard
Type	00-30	00-50	M4601	184
Shore hardness	00-30	00-50	28A	50A
Elongation at break	900%	980%	700%	150%

V. CONCLUSION (∼ %5)

A conclusion may review the main points of the work, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications, extensions, and improvements.

APPENDIX

Insert the link to an edited video (unlisted Youtube) of your project and a brief description of supplementary materials (code, properly labelled data, etc.). State each student's contribution to the project and report according to the provided template on ItsLearning.

REFERENCES

[1] J. F. Wilson, I. Norio, Bellows-type springs for robotics, Proc. Adv. Spring Technol. JSSE 60th Anniversary Int. Symp., 109–119 (2007).