FLEXA - Flexible Anima :Soft robot with Braccio as the Bone

Takafumi Imai
Faculty of Policy Management,
Keio University,
Endo 5322, Fujisawa-shi,
Kanagawa, Japan
s14116ti@sfc.keio.ac.jp

Hasegawa Tatsuya
Faculty of Environment and
Information Studies,
Endo 5322, Fujisawa-shi,
Kanagawa, Japan
t15717th@sfc.keio.ac.jp

Yusuke Maikuma
Faculty of Policy Management,
Keio University,
Endo 5322, Fujisawa-shi,
Kanagawa, Japan
s14756ym@sfc.keio.ac.jp

Nao Yamato
Faculty of Environment and
Information Studies,
Endo 5322, Fujisawa-shi,
Kanagawa, Japan
t15580ny@sfc.keio.ac.jp

Abstract
FLEXA, which stands for Flexible Anima,is a new type of a soft robot as an unknown creature that only has the sense of touch.It stretches capacitive sensors around the body, and its sensitive skin detects the people's accession without touching.

FLEXA's comfortable-looked body covered by the power beads' cloth will attract lots of people. In contrast, once FLEXA detects the people's accession, it runs away from the enemy, human. FLEXA which has five joints is able to run away to several directions, but it doesn't have high mobility. When it fails to run away from people and is touched, it tries to head off the crisis with the squeezing transformation to increase the solidity and the behaving violently.

The more FLEXA resists to people, the more it arouses the people's desire to touch it. FLEXA is such a curious soft robot.

Author Keywords
Arduino Braccio, soft robotics

ACM Classification Keywords
Design, Human Factor

Introduction

What FLEXA offers is interaction with unknown creature. You must want to touch it when you look at the comfortable-looked body. But at that time FLEXA will detect your accession and avoid you. You will feel as if the robot were alive and trying to avoid you extremely.

Researchers have already investigated robots which have multiple joints in several ways. For instance, Nakagaki(2015) proposes the interaction between "LineFORM" and people utilizing its snake-like flexible transformation[1]. Though it is specialized for the shape change, it does not refer to its behavior like organisms.

On the other hand, Okada(2012) stated that the useless looked actions are useful for the communication with people on the sociable robots [2]. However, he did not focus on the somatic sensation or the discommunication. Based on these prior researches, we consider that FLEXA could be defined a new type of soft robot, which does not become attached to people.

Implementation

-Physical Design

FLEXA consists of the following four parts: the micro beads, the polyurethane elastic fiber, capacitive sensors, and the Arduino Boracic. We increase the number of the Braccio's joints from three as default to five. The expanded Braccio is covered by the polyurethane elastic fiber including the powder beads. Capacitive sensors are embedded in the fiber. Then, we set FLEXA on the table. It is connected to the micro computers (Arduino Uno and Braccio shield) under the table. FLEXA covered with the white fiber looks like a strange creature combined its wiggly movement.

-Input

FLEXA detaches the touch from people by using the capacitive sensors concealed by the cloth. Each part has its capacitive sensor, so FLEXA is able to distinguish the point where people touch. Furthermore, it differently detects the accession and touch from people.

-Output

FLEXA sways slowly in the normal state, but its Braccio's servo motors are controlled once people make approaches to it. The movement looks like it runs away from enemies with wiggling its body. Moreover, it squeezes itself to a huddled shape following the defensive instinct when people completely touch it. In the absence of stimulation, it assesses its safeness and starts to sway.

References

1.Ken Nakagaki, Sean Follmer, Hiroshi Ishii. LineFORM: Actuated Curve Interfaces for Display, Interaction, and Constraint.UIST '15, November 08-11, 2015, Charlotte, NC, USA. ACM 978-1-4503-3779-3/15/11. http://dx.doi.org/10.1145/2807442.2807452

2.Daiki Tanaka, Takahiro Asano, P. Ravindra S.De Silva, Michio Okada: Peepho-Towards A Future Social Eyepiece, 3rd Robot Design Competition, The fourth International Conference on Social Robotics (ICSR2012).