

ENVELLA: MAKING SPACE PERSONAL

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The paper describes enVella, a kinetic dress that moves when triggered by the detection of the wearer's fear or anxiety. The aim of this project was to investigate the detection of fear with biosensors, and to see whether an enveloping physical transformation can provide a sense of comfort to the wearer.



enVella open and close comparison, 2010, Mark Coleman, Emily Ip, Henry Lin, Alice Ling, Laurence Man, photographic media, Copyright 2010 Henry Lin.

INTRODUCTION

enVella is a kinetic dress which moves when triggered by the detection of the wearer's fear or anxiety. The upper portion of the dress is encircled with fans, which open and envelop the wearer if her body temperature and heart rate are both rising. The aim of this project was to investigate the detection of fear with biosensors, and to see whether an enveloping physical transformation can provide a sense of comfort to the wearer. The paper will begin with the inspiration behind enVella, discuss its design, and conclude with the technical aspects of the project.

INSPIRATION

enVella draws inspiration from the natural world specifically with regards to animals' reactions to fear and the idea of engendering feelings of safety in human beings. An experience everyone has in common is that of being in a mother's womb. In a warm, enveloped space, one feels safe, warm and protected as if one was inside the mother's womb. [3] Despite not offering any real protection, we instinctively huddle under a blanket when frightened.

enVella's motion was inspired by the frill-necked lizard which is capable of erecting a normally-concealed frill from around its neck. This physical transformation makes the lizard appear larger than it is, and so a less appealing prey. [4] By merging this reptilian defense mechanism and the soothing of envelopment, the hope was that this combination would produce a comforting psychological reaction in the wearer during anxious moments.

DESIGN

In an attempt to recreate the sensation of being enveloped inside the mother's womb and implementing the frilled-neck lizard's self-defense behaviour of increasing in size towards wearable technology, this adventurous application explores the concept of embodiment where the dress and wearer engages in a symbiotic relationship. In order for enVella to achieve its full potential, the dress must be worn for it to react accordingly with the wearer's emotional state. Without a pulse, the dress cannot achieve its full potential and without the dress, the wearer will not be able to experience the safety, comfort and protection provided by enVella.

enVella is designed on a white cotton dress attached with four servo-controlled fans. Each fan is constructed of satin fabric folded in half multiple times, and held in place by heavy duty double-sided fusible interfacing. Wooden supports were added onto the ends of each fan to provide motor and anchor support. At the base of each fan, a servo attachment was glued. The fans are triggered by a combination of the two sensor inputs: a heart rate monitor and a temperature sensor. If the wearer's current heart rate and temperature is greater than a predefined average heart rate and body temperature, the fans will open – beginning at the chest then around the neck in a sequential manner (Fig 1). With the fans in their opened form, heart rate and temperature data continue to be relayed from the sensors to the microcontroller. If both heart rate and temperature return to normal after 20 seconds, the fans will close.

The core element of enVella was inspired by animals with distinctive self defense reactions such as the frilled-neck lizard. Through user studies, few design forms were determined as most effective at enveloping the wearer and embodying the idea of comfort and warmth. The four fans were strategically placed and programmed to optimize the enveloping experience. When a state of anxiety or fear is detected by the microcontroller, the fans will open in smooth succession. Because enVella is a dress designed to comfort the wearer, the decision to have the fans open was to create a sense of division between the wearer and the frightening, threatening entity. This invisible wall creates a psychological barrier between the two and thus alleviating some of the resultant fear. A gradual enclosure of the space around the wearer's visual field, rather than a sudden one, adds to the comforting quality of the motion. Whereas if the fans were to open rapidly, it would have an opposite effect on our intention of comforting the wearer.

TECHNICAL

Among the technical challenges present in enVella, detecting and identifying fear was the most difficult to justify through biosensors. One challenge was to find a suitable solution to distinguish fear from other strong emotions like anxiety and anger. Fear is generally differentiated from anxiety by the perception of a specific external threat. However, for our purposes, it was not possible to distinguish one from the other as anxiety and fear have almost identical physiological symptoms. Typical physiological responses to fear and anxiety elevated heart rate, increased sweating, and increased blood pressure. Both the input of heart rate and body temperature were chosen for the purpose of this project, as an indication to measure state of fear. Various heart rate monitor circuits have been developed with Arduino using different methods but the majority of implementations use the Polar RMCM01 Heart Rate module. The Polar Heart Rate Monitor Interface (HRMI) was selected given the added difficulty of working with the bare module. The multiple interfaces available in this new module make it very stable, flexible and easy to work with.

CONCLUSION

enVella project designers witness the success of the dress and how it achieves envelopment through the natural motion of fans. User feedbacks have been positive, with the majority stating they found the enveloping effect comforting. A few participants raised possible issues with the feasibility of a cloth dress offering sufficient protection, and concerns over providing comfort without actual protection. Participants also mentioned possible discomfort and unease that may arise from users who are claustrophobic. Through academic research, the team on designs inspired by nature and explored various forms before finalizing on fans to create temporary personal space. enVella is not only a dress but is also a concept to assess the research question of creating personal space in a state of fear.

References and Notes:

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4. Sylvers, Patrick, Jamie Laprarie and Scott Lilienfeld, "Differences Between Trait Fear and Trait Anxiety: Implications for Psychopathology," *Clinical Psychology Review* 31, no1: 122–137.