

Background

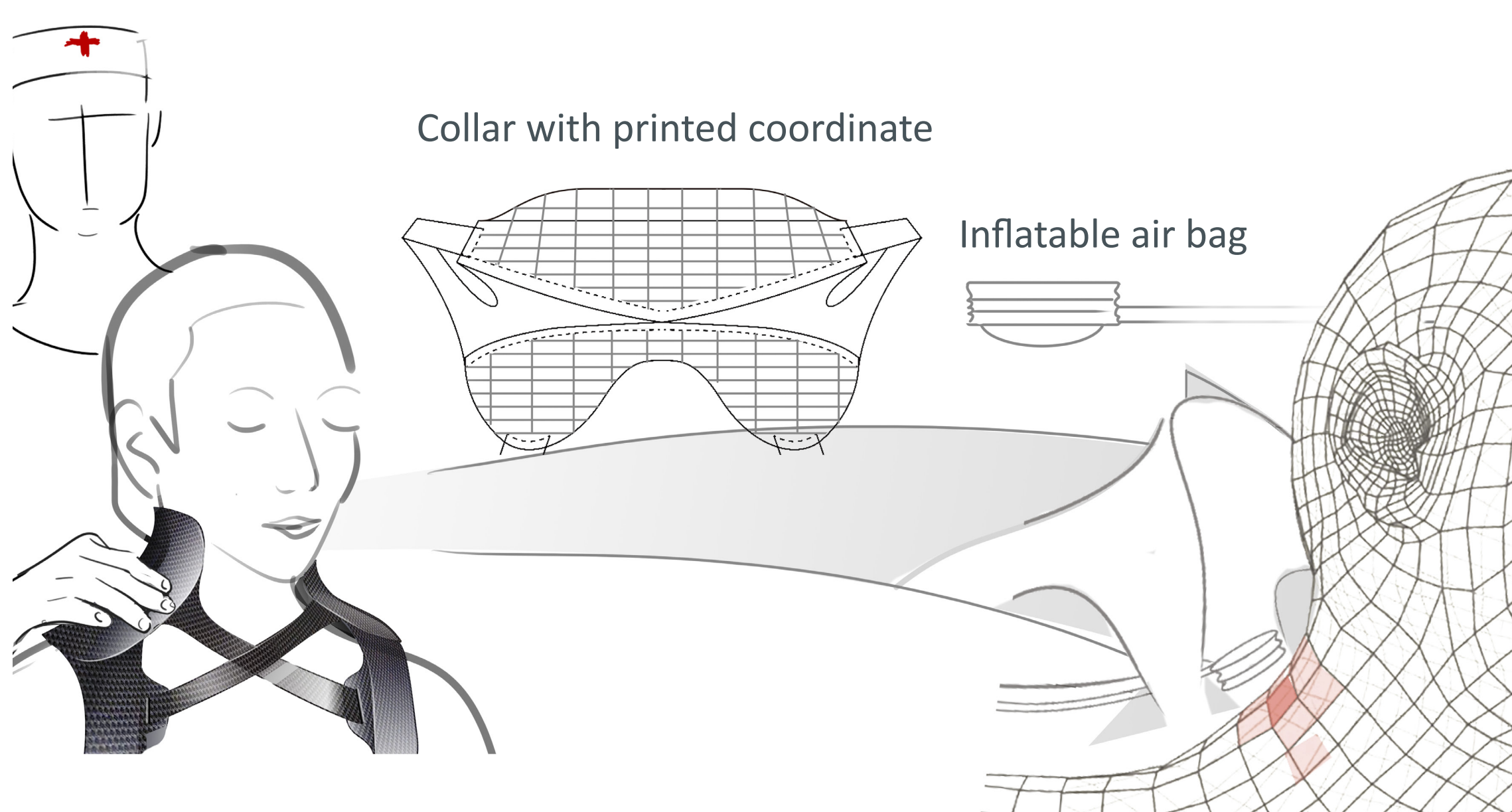
Office workers who hold a static posture during prolonged computer work have the highest incidence of neck disorders at 34---49% a year (42% in Thailand, 34% in Finland, 36% in Sweden, and 49% in Australia) (Fejer, 2016). It is not a life-critical problem, but it is affecting people's life quality. Clinical massage, as one of the main treatment methods, has been proved to be effective by many studies. However, the target users, office workers, and students don't have enough time nor money to visit therapists frequently. There are some massage devices on the market, but they cannot be used to treat neck pain. Most of them do the same to every user while people vary in body size and symptoms. There is one professional clinical massage device, but it is designed for clinics. It is a robot arm controlled by therapists so patients cannot use it on their own. Moreover, it is too expensive for personal use.

Solution

In this project, a smart device was designed by applying principles of clinical massage and Cyber-Physical Systems. Since it is hard to give a reliable assessment by a machine, it is decided to involve therapists in the assessing phase. The idea is to record what the therapist did in the massage treatment and recreate that with the device. With a pressure sensor matrix, the device can remember where the force was exerted, how hard the pressure was, and how long it lasted. With this information, the device will be able to figure out what technique the therapist used and then control the actuator to perform the same technique at the same position with the same force intensity.

Professional neck massage device in everyday surroundings

A solution applying principles of Cyber-Physical Systems



Working principle

There are two collars with the same shape and size. One of them is embedded with pressure sensor matrix. Users get massaged by therapists while wearing this collar. Then, the recorded positional information is translated to coordinate information on the other collar. Users attach the massage elements on the collar under the instruction of the system. The massage element consists of an airbag. It inflates to exert pressure to muscles on the neck. The controlled inflation and deflation of airbags simulate the movement in a massage treatment. While wearing the collar, users lie on a pillow that fit with their body. In this way, gravity provides the reactive force.

Prototype



Scenario

For the target group, their neck pain is highly related to working. It is favorable to have the massage device accessible in this working environment. So the device is mounted on a chair. Organizations such as school and companies can buy the chair and put it in the rest area. Then the employees or students can share it. If people want to buy one for personal use, they can only buy the massage device and use it on a bed.

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"Professional Neck Massage Device in Everyday Surroundings"
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Integrated Product Design

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