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Wearable Electronic Patch to Measure Skin Temperature and Humidity

A flexible wearable electronic patch to measure temperature and sweat to provide heat stress safety warnings

Reference: Skin Temp and Humidity

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IP Status

No patent

Seeking

Development partner, Commercial partner, Licensing, Seeking investment

About **Dublin City University**

Dublin City University (DCU) aims to transform lives and societies through education, research and innovation. Research and Innovation at DCU stems from the academic excellence of its four faculties coupled with a passion for translating knowledge into innovations for economic or societal benefit.

Tech Overview

This project aims to develop a wearable sensing system for healthcare setting which would allow early detection of COVID-19 symptoms. Wearable devices will integrate temperature and humidity sensing with passive RFID technology. Using RFID means that it is powered remotely by a radio signal, eliminating the need for batteries. RFID tags can be made into flexible devices either as electronic tattoos, patches or smart textiles. The advantage of using RFID is that the wearable device is powered by a radio signal at a central hub. This hub would identify and power each of the wearable sensors and allow contactless measurement of temperature and skin humidity of individuals, e.g. in a healthcare setting, along a marathon route or a sports playing pitch.

FURTHER DETAILS

Deignan, Jennifer, Florea, Larisa, Coyle, Shirley and Diamond, Dermot (2016) Contactless conductivity sensor for wearable sweat monitoring. In: Analytical and Nanoanalytical Methods for Biomedical and Environmental Sciences, 29 Jun - 1 Jul 2016, Brasov, Romania.

Deignan, Jennifer, Florea, Larisa , Coyle, Shirley and Diamond, Dermot (2016) Wearable chemical sensing – optimizing fluidics for real-time sweat analysis. In: Conference on Analytical Sciences Ireland 2016, 14-15 Apr 2016, DCU, Dublin, Ireland.

Glennon, Thomas, O'Quigley, Conor, McCaul, Margaret, Coyle, Shirley, Matzeu, Giusy, Coleman, Simon, Ben Azouz, Aymen, Beirne, Stephen, , Wallace, Gordon , White, Paddy, O'Mahoney, Niamh and Diamond, Dermot (2016) 'SWEATCH' – A platform for real-time monitoring of sweat electrolyte composition. In: ACES2016 Symposium, 10-12 Feb. 2016, Deakin University, Melbourne, Australia.

Benefits

The device will be a battery free, lightweight flexible device that is easy to apply. The device will offer a new method of health monitoring to give heat stress safety warnings and ensure personal hydration needs are met.

It will also provide a non-invasive contactless way to measure temperature, which would help with monitoring early detection of fever linked to illness such as Covid-19. This would reduce the time involved taking individual measurements of staff in work settings. This is of particular relevance in healthcare settings where current recommendations are for temperature of healthcare workers to be taken twice a day.

Body temperature can change throughout the day and depending on environmental conditions and what activities are being undertaken. The normal range is between 36.2 and 37.5°C, varying between individuals and affected by factors such as weight, height, age and gender. Therefore what may be within the normal range could in fact be a low grade fever for someone who's normal value is at the lower end of the scale. This approach would allow a personalised approach to be taken to managing individual's well-being.

Applications

Healthcare workers

Frontline healthcare workers can spread the COVID-19 virus before realising that they are infected themselves. There is a need for a solution for early detection of COVID-19 symptoms. Healthcare working falling ill with the COVID19 virus or having to self-isolate puts further strain under the healthcare system

As of 29th April 2020, 5,568 of healthcare workers tested positive for COVID-19 which accounts for 28.2% of overall cases, Nursing homes (35.2%) and residential institutions (18.9%) accounted for most of the clusters of cases. In these settings people are in close proximity, and healthcare workers are interacting with multiple residents therefore this increases the reproductive rate of the virus. These settings also accommodate the most vulnerable groups of our population that are susceptible to COVID-19.

Symptoms can occur 2-14 days after exposure to the virus. Monitoring for fever, which has been reported in 98% of confirmed cases allows early detection to signal a warning for further analysis of symptoms and this can significantly reduce the spread to others, e.g. for a healthcare worker in a nursing home this could reduce the spread to over 20 at risk people over two days.

This is critical in nursing homes and residential facilities where there are vulnerable populations living in close proximity. Nursing homes account for more than 50% of COVID-19 deaths in Ireland and there are over 350 clusters within nursing homes and residential settings.

Sports performance and athlete well-being

Heat stress can occur when training in hot environments when the body is unable to maintain its temperature equilibrium, strenuous exercise in the heat can increase the risk of suffering from heat stress. This can cause the body's core temperature to rise to levels that affect other physiological processes. Hydration status, fluid replacement before, during, and after exercise is important, and this is highly individual, e.g. some people tend to have higher sweat rates, and the levels of electrolytes in sweat is also very much unique to the individual. Being able to monitor sweat patterns during different exercise regimes under different environmental conditions could help to provide more tailored rehydration strategies. This can optimise athletic performance, and also give warnings to indicate early stages of heat stress.

Current methods of measuring sweat loss is based on bodyweight before and after exercise. There is no system commercially available for real-time analysis.

Electronic skin patches market opportunities

A recent report by IdTechEx on Electronic Skin Patches 2019-2029 reveals significant opportunities, with over $7.5bn in revenue made from electronic skin patches in 2018, and a forecast for this to grow to over $20bn per year by 2029.

Opportunity

- DCU are looking for partner organisations who can validate the concept and participate in field trials to test the technology.
- DCU are interested in business and technology partners who can help bring this technology to market. The researchers have identified a number of potential applications – healthcare, animal care, sports, remote workers in adverse conditions. There may be other potential markets.
- DCU are also keen to engage with other technology or research providers who have complementary expertise or technology.

For Further Information please contact

Carolyn Hughes
Director of Business Development Manufacturing, Engineering, Energy & Water - DCU Invent
carolyn.hughes@dcu.ie