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WEARABLE SENSOR IS USED TO PROTECT THE WOMEN'S LIFE

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ABSTRACT

The terms "wearable technology", "wearable devices", and "wearable's" all refer to electronic technologies or computers that are incorporated into items of clothing and accessories which can Comfortably be worn on the body. These wearable devices can perform many of the same computing tasks as mobile phones and laptop computers; however, in some cases, wearable technology can outperform these hand-held devices entirely. Wearable technology tends to be more sophisticated than hand-held technology on the market today because it can provide sensory and scanning features not typically seen in mobile and laptop devices, such as biofeedback and tracking of physiological function. Wearable computing facilitates a new form of interaction between the human and the computer comprising a small body worn computer that is always accessible and ready for use. A wearable computer used for such operations is incorporated into the personal space of the user, control by the user and is always on and accessible.

Key Words: Wearable technology, Wearable device, electronic technology, Wearable computing.

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1. INTRODUCTION

These wearable devices can perform many of the same computing tasks as mobile phones and laptop computers; however, in some cases, wearable technology can outperform these hand-held devices entirely. Wearable technology tends to be more sophisticated than hand-held technology on the market today because it can provide sensory and scanning features not typically seen in mobile and laptop devices, such as biofeedback and tracking of physiological function. Generally, wearable technology will have some form of communications Capability and will allow the wearer access to information in real time. Data-input capabilities are also a feature of such devices, as is local storage. Examples of wearable devices include watches, glasses, contact lenses, e-textiles and smart fabrics, headbands, beanies and caps, jewelry such as rings, bracelets, and hearing aid-like devices that are designed to look like earrings.

2. MOTIVATION

A new wave of accessory, smart devices are rolling out to help you manage updates without draining your phone's battery or having it out all the time. The Smarty Ring is a new twist on the idea to funnel all your data and info through your fingertips. A stainless steel ring with a digital display alerts you to calls, updates, needed info, or use it as a timer, clock or even remote control.

3. SCOPE

Due to the application of wireless miniature sensing system (biosensors), the production of wearable biosensors is rapidly increasing. These wearable biosensors have been designed by exploiting the current knowledge of biotechnology and biological systems. They all the fine monitoring of the phylogical system signals sent by the local police station or social network. They also utilized the knowledge applied electronics. They are extensively being used for the woman production. They activities are recorded within the biosensor for future. A discrete way to check your incoming calls and messages without taking your phone out and disturb the things you are doing, is the Smarty Ring. With this fashion item you can control your phone without touching it, get real time updates from Face book, Twitter, Hangout & Skype, trigger the camera, control your music, track your phone and check the time.

4. SMARTY RING IN WEARABLE SENSOR

The population of aged people increases, vital sign monitoring is increasingly important for securing their independent lives. On-line, continuous monitoring allows us to detect emergencies and abrupt changes in the Women's conditions. Especially for Women's, on-line, long-term monitoring plays a pivotal role. It provides critical information for long-term assessment and preventive diagnosis for which long-term trends and signal patterns are of special importance. Such trends and patterns can hardly be identified by traditional examinations. Those problems that occur frequently during normal daily activities may disappear the moment the women's monitoring systems.

Smarty Ring is connected to your phone via Bluetooth to alert you to all phone calls, texts, emails and updates from your social media. The ring acts as a clock to tell you the current time (or a different time zone) along with a timer function, stopwatch and alarm. An interesting function of the ring is that it acts as a remote control for your camera or your music. An induction charging stand can power up both the ring and your phone and wearing the two in tandem alerts you if the phone gets more than 30 feet away in the case of theft or forgetfulness.

5. WIRELESS CHARGER

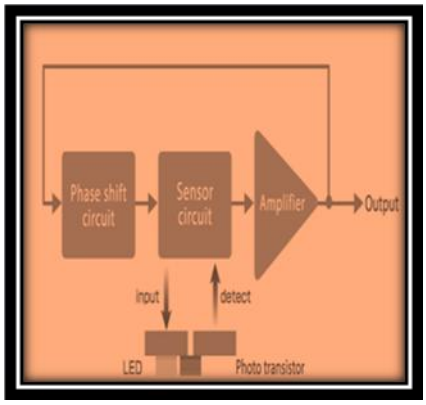
Charge your smart phone and Smarty Ring at same time. No plug in hassles, just place your Smarty Rings and smart phone over the charger to get it charged!

Fig.1 Wireless charger

Smart rings or pointing devices literally envision the world at your fingertips. This new incredibly innovative technology allows consumers to control gadgets and other smart devices with gestures. It enables "writing" words in the air and selects menu items by tracing fingertip movements. These smart rings could be targeted for consumer and professional applications: simplifying daily use on the one hand or providing 3D interactive workspace functions on the other. They come in different exterior variations, some attempt to be more visually appealing as an adorned jewelry accessory for women, while others take on a more innovative look. Each smart ring also varies in the different functions it provides as well as its sensor capability.

6. WIRELESS CHARGING SOLUTION FOR YOUR SMART RING

Fig.2 Solution for smart ring



To create a truly miniature and comfortable smart ring solution, it must be coupled with a seamless wireless charging solution. Humalog's tiny receiver can integrate into the smallest of devices, allowing easy implementation within smart ring and a comfortable charging solution for users. With Humalog's ETERNA wireless charging platform, the need for a USB port is eliminated altogether, imperative in such a small device and necessary for a much wanted waterproof solution.

7. WORKING PROCESS

- "Hugging" the ring by one person transmits the touch sense digitally to the other ring which replicates the sensation.
- Using Bluetooth 4.0 the ring communicates with your smart phone which transmits the touch message over the internet.
- To pair two rings all you need to do it bring them together to trigger its powers, or, if they

are remote – use the complementary mobile app.

The ring supports 3 types of hugs: a Mini-Hug, an Intense Hug, and an Urgent Hug (short squeeze, long squeeze and a series of hugs in a row – respectively)

User can also set their partner's ring led color. There are 5 different colors (green, blue, yellow, red, orange) and user can set each of the color to a certain emotion.

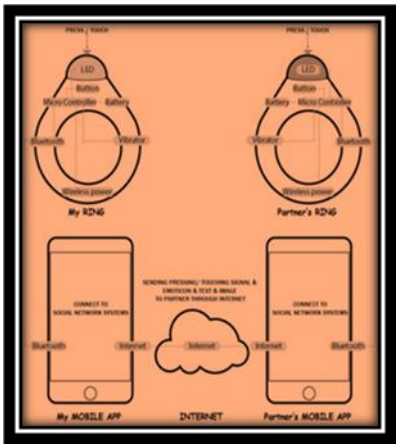


Fig.3 working process

The ring comes with a corresponding private social network for two where you can send corresponding messages, photos, videos, together with your physical ring hugging. It also displays the time, date, and location of all you're sent and received hugs. The ring synchronizes with the social network app seamlessly. It allows you to customize the functions of the ring, pair with your ring of choice.

8. THE RING SENSOR

8.1 BASIC CONSTRUCTION

The ring sensor is a miniaturized, telemetric, monitoring device worn by a Women's as a finger ring. The ring encapsulates PPG, pulse oximetry combined with wireless communication and miniaturization technologies. This device optically captures the pulsation and oxygen saturation of the arterial blood flow, and transmits the signals to a host computer via a radio-frequency (RF) transmitter.

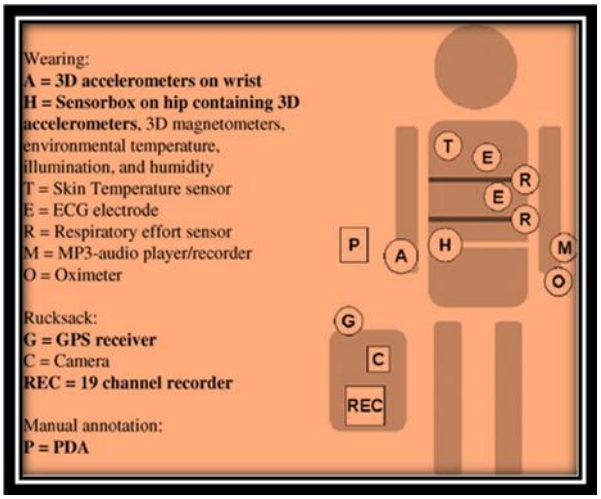
Fig. 1 shows a conceptual diagram of the ring sensor. The ring sensor consists of optoelectronic components, a CPU, a RF transmitter, a battery, and a ring chassis. The optoelectronic components, i.e., micro pho-to diodes and LEDs, detect the blood-volume waveforms and oxygen-saturation level at the Women's digital artery. The CPU controls the LED lighting sequence as well as the data acquisition and transmission process. These signals are locally processed by the on-board CPU and transmitted to a host computer for diagnosis of the Women's cardiovascular conditions. The ring sensor is completely wireless and miniaturized so that the Women's can wear the device comfortably 24 h/day.

9. METHODS

A. DATA COLLECTION

The devices used in the data collection and their locations on the body are illustrated in. Although this figure includes sensors from which data are not used in this study, in the figure for more complete picture of the data collection system. Acceleration signals were measured with ADXL202 accelerometers(Analog Devices, Norwood, MA), and were store don a flash-card-memory-based, 19-channel recorder (EmblaA10, Med care, Reykjavik, Cleland). Sampling frequency was20 Hz, and the range of the sensor output was ±10 g.Location information was stored on a Garmine TrexVentureGPSreceiver(Garmin Ltd., Olathe, KA) once per 20 s.

Fig4: Data collection and annotation system. The sensors and devices relevant for this study are printed in bold.



B. SIGNAL PROCESSING

Signal features were calculated for each second of the data collection. Time-domain features calculated were mean, variance, median, skew, kurtosis, 25% percentile, and 75% percentile .Frequency-domain features included the estimation of power of the

frequency peak and signal power in different frequency bands. Speed was calculated from GPS location data. Spectral entropy SN [22] of the acceleration signals for the frequency band 0–10 Hz was calculated as

$$S_N(f_1, f_2) = \frac{-\sum_{f_i=f_1}^{f_2} P(f_i)\log(P(f_i))}{\log(N[f_1, f_2])} \quad (1)$$

Where P (fi) represents the power spectral density (PSD) value of the frequency fi. The PSD values are normalized so that their sum in the band [f1, f2] is 1. N [f1, f2] is the frequency components in the corresponding band in PSD. feature selection proceeded by identifying for each feature having the best performance in discriminating activity from other activities. The performance of each feature was evaluated by the area under the receiver operator characteristic (ROC) curve.

10. TWENTY-FOUR HOUR MONITORING SYSTEM

Using the prototype ring sensor, a 24 hour monitoring system has been developed. In the monitoring system, receivers are placed at appropriate places in a home and are connected with a home computer through serial cables. The home computer analyzes the transmitted photo plethysmograms and sends warning signal to a tele marking center through telecommunication channel such as internet if any abnormality is detected. The ring sensor and the 24 hour monitoring system have the following distinctive features:

Photoplethysmograpy and pulse oximetry for Diagnosis The ring sensor measures and transmits photoplethy smographicsignals to the home computer in real time. The photo plethysmogram provide a rich variety of diagnostic information, from which a class of cardiac and circulatory disorders can be detected. For example, a recent investigation has revealed that the likelihood of heart attack can be predicted by examining the rhythm of a plethysmogram over a long period of time. Also, peaks of the acceleration plethysmogram, i.e., the curve obtained by twice differentiating the original plethysmogram, provide important information for arteriosclerosis diagnosis. Pulse oximetry was also implemented in the ring sensor using two wavelengths of light, as shown above. A Women's saturated oxygen level is known to provide one of the most fundamental physiological variables needed for diagnosis of cardiovascular disorder such as congestive heart failure Continuous monitoring

Twenty-four hour continuous monitoring can be performed for an extended period of time, i.e., many months or years. This would provide unique physiological data and allow new types of health care services, which would be difficult to provide in traditional hospital facilities. Traditional medical exams conducted at hospitals are inevitably snap-shot data or short-term data taken under special conditions, while ring sensors would provide continuous, long-term data of vital signs.

Diagnosis can be made based on vast amount of data points, trends, and signal patterns as well as transitory and fugitive symptoms. By exploiting this continuous monitoring feature, develop an innovative health monitoring not only diagnoses the Women's health status but also predicts the likelihood of emergency and serious conditions.

11. WOMEN'S LOCATION ESTIMATION

The location of the ring wearer can be roughly the ring sensor. Since the power of the is very small, the signal reaches only in range. Therefore, the detectable signal localized and the possible wearer's position is confined within a local range. In the monitoring system, we use two types of receivers: a global receiver and local receiver. The global receiver has a broader range of reception and covers almost the entire house. A local receiver has a narrower range and is located in multiple places in the house. The objective of using many local receivers is twofold:

1. To cover the entire house. No matter where the wearer moves within the house, the monitoring signal must be received.
2. To locate the ring wearer. Examining which local receiver within the house receives the incoming signal, one can locate the ring wearer.

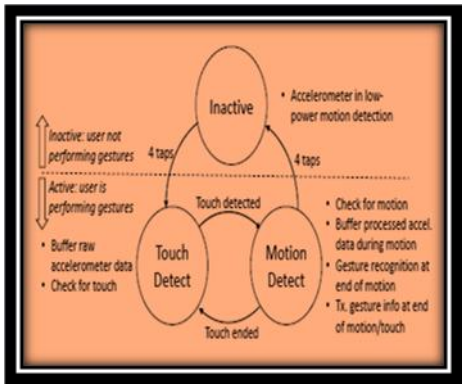
The location of the provides useful information, which would supplement physiological measurements. Combining the Women's location information with physiological data, the Women's conditions can be better understood. For detecting emergency situations, for example, the Women's location within the home is critically important. If the ring wearer stays in a bathroom for more than an hour, or stays in a staircase area for half an hour, the physiological variables must be scrutinized to detect a possible emergency case. Furthermore, the Women's location information can be used for interpreting the physiological variables, since the type of the Women's activity is related to a particular location within the home, i.e., shower room for taking a shower, bed room for rest, staircase for leg motion.

12. EVALUATION AND RESULT ANALYSIS

The ring is an active device that detects and parses various gestures that the user performs on the surface, and transmits these gestures to a remote device wirelessly. The energy required for these operations are opportunistically harvested from an NFC-enabled phone held in the user's hand, enabling perpetual operation without explicit recharging.

The ring is designed to be worn on the index finger of the user, and the user performs various gestures on an avail- able surface using the index finger. The user can interact with almost any type of surface as long as the surface produces sufficient friction, as explained in Section 3. It can identify 23 different gesture primitives for supporting tap, scroll, swipe, and written text-entry on a remote device UI. The identified gestures are transmitted wirelessly to a remote UI device.

Fig: 5 The ring transitions among active, touch detect, and motion-detect states based on user taps, touch, and motion of the finger on a surface.



The ring has three main sensing elements. An accelerometer is used to capture inertial data during gestures for gesture identification. A force sensitive resistor (FSR), which changes its resistance based on the applied force, is placed next to a tendon of the finger used to detect if the finger is touching a surface. An audio based sensor is used to detect the motion of the finger on the surface, based on the audio generated by the friction between the finger and the surface.

During normal operation, the ring is in an inactive sleep state to prevent accidental interpretation of day-to-day user activities as gestures. In this state, the ring's accelerometer is in a low-power autonomous motion-detection state.

When the user is ready to enter gestures on an available surface, the ring is brought into active state by tapping the surface 4 times. Once in active state, the ring enters touch- detect active state by turning on the touch detection sensor. The 1st tap helps trigger the accelerometer motion-detector, while the rest of the taps are used to reduce accidental triggering of active state. Raw accelerometer readings are collected and buffered during the touch-detect state.

When the user touches the surface to enter a gesture, the touch is detected by the touch detector, and the ring enters motion-detect state. In the motion-detect state, the audio-based motion detector is turned on to detect the motion of the finger along the surface. During this state, processed accelerometer components along plane of the ring are stored. At the end of motion or the touch, these processed accelerometer data is fed to a classifier to identify the gesture.

13. HARDWARE COMPONENT

13.1OFF-THE-SHELF HARDWARE

13.1.1. INITIAL ATTEMPTS

Figure 6: The initial Tag Sense reader and tag

In the beginning stages of the project, passive magnetically-coupled RFID transponders were explored, because passive transponders are extremely simple, and can to some extent indicate their distance from the reader by their signal strength. Similar systems of this type had been implemented before with success in previous work of the Responsive Environments group at the MIT Media Lab, as described in the last section (although those tags were chip less).

The reader that we used was the Tag Sense LC-10 Chip less Reader (http://www.tagsense.com/), sweeping from 1 to 50MHz. With it, various passive RFID tags could be used. Figure 2-1 shows the size of the reader and one of the possible tags that could be used with it. This system was infeasible, however, for a number of reasons.

1. The signal strength of tag can also be tied to its orientation
2 .The tags and reader were too large
3. The reader was not fast enough
4. The range of the reader was too limited
5. It was difficult to interface between the computer and reader

While searching through possible solutions, it was found that the UHF band (860MHz to 960MHz)would allow for a reduction in tag size and also in reader size, while still penetrating the human body to a reasonable extent, avoiding major occlusion problems.

Also it was found that microprocessor-equipped tags, the WISP project in particular, might also provide a viable solution to our desire to track the position of a finger - especially since the WISP already incorporated an accelerometer on the tag and required no power source except for the reader itself.

13.1.2. RFID READER

Figure: 7 The M5e USB reader from Thing Magic

The reader used in the subject system was the compact Mercury 5e USB reader This reader suits our purposes well, because it is in the UHF band, 28 which means it can be used with small tags due to the smaller wavelength.

The special tag we later decided to use with the system also functioned in the UHF band. It also interfaces easily with the computer through the USB port and comes with a ready-made API allowing for quick and painless development of user interfaces in many programming languages.

Later, a higher power version of this reader was used, the M5e, that allowed for considerably longer range and faster read rate. A new antenna, a monopole whip, was also used in the final system, also upping the range and read rate.

14. FEATURES

14.1 SUBTLE NOTIFICATIONS

Whether you're in a meeting or on a date, the Smart Ring will discretely vibrate whenever you receive a notification, alerting you of the latest update.

14.2 BE IN CONTROL

The VIP feature enables you to have complete control over which types of updates come through and even the ability to create a list of contacts of notification - worthy people and events.

14.3 STYLISH YET RUGGED

Available in two different colors, its sleek design is engineered to withstand day-to-day wears and tears, and is shock-resistant and waterproof.

14.4 SMART POWER

Low-energy Bluetooth 4.0 communications provides a stable connection between your phone and your Smart Ring.

14.5. AUDIO-BASED FINGER MOTION DETECTION

We use the acoustic signals generated due to the friction when finger moves across the surface to detect finger motion on the surface. The amount of audio energy emitted from the finger and surface interaction is a function of the speed of finger motion and the physical properties of the surface.

The acoustic properties of friction have been well studied in a formal mathematical context. To understand the amount of available acoustic energy on commonly found surfaces, we augmented a glove with a low-power microphone.

15. SPECIFICATIONS

Table: 1 Physical and Environment Characteristics

PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS	
Dimensions:	1.9 in. H x 1.4 in. W x 1.9 in. D 4.8 cm H x 3.6 cm W x 4.8 cm D
Weight:	2.0 oz./56.7 gm
Current:	92 mA typical/121 mA max (one LED on)
Standby Current:	12 µA typical/60 µA max
Voltage:	3.1 VDC to 3.6 VDC
Vcc Noise Level:	100 mV peak to peak max.
PERFORMANCE CHARACTERISTICS	
Light Source:	650nm LASER 1.55mW
Scan Rate:	92 min., 104 typical, 116 max. scans/sec (bidirectional)

Table: 2 Performance Characteristics

PERFORMANCE CHARACTERISTICS	
Light Source:	650nm LASER 1.55mW
Scan Rate:	92 min., 104 typical, 116 max. scans/sec (bidirectional)

Table: 3 Working Distance

NOMINAL WORKING DISTANCE:							
Density:	5 mil	7.5 mil	10 mil	13 mil	20 mil	40 mil	55 mil
Code Type:	39	39	39	UPC	39	30	39
Far (Guaranteed):	4.75"	8.75"	13.25"	17.25"	21.5"	22.25"	27"
Far (Typical):	8.75"	14.25"	N/A	24.25"	35.75"	N/A	50.5"
Yaw[1]:	± 50° from normal						
Roll[2]:	± 35° from vertical						
Pitch[3]:	± 65° from normal						

Table: 4 User Environments

USER ENVIRONMENT	
Operating Temp.:	-4° to 122° F/-20° to 50° C
Storage Temp.:	-25° to 160° F/-40° to 70° C
Humidity:	5% to 95% non-condensing
Ambient Light	Tolerant to typical artificial indoor and natural outdoor (direct sunlight) lighting conditions. Fluorescent, Incandescent, Mercury Vapor, Sodium Vapor, LED: 450 Ft Candles (4,844 Lux) Sunlight: 8000 Ft Candles (86,111 Lux) **Note:** LED lighting with high AC ripple content can impact scanning performance.
Drop Spec.:	Multiple drops to concrete: 4 ft./1.2 m across the operating temperature range
Sealing:	IP54

Table: 5 Regulatory

REGULATORY	
Electrical Safety:	Certified to CSA C22.2 No. 60950-1, EN60950-1, IEC 60950-1
EMI/RFI:	FCC Part 15 Class B, ICES-003 Class B, European Union EMC and R&TTE Directives, Australian AS/NZS 4268
Laser Safety:	CDRH Class II, IEC 60825-1 Class 2

16. CONCLUSION

A wearable smart ring that can turn your palm into a gesture interface to control multiple devices. The ring sensor and smart ring are an effective, comfortable, and mobile information infrastructure that takes the advantage of and information processing. Walking around alone in the middle of the night can be scary – especially for women. It doesn't matter if you are walking home from a party or backpacking in an unfamiliar country. In this article we will show you a few wearable's that make you feel like someone is with you all the time. They might not prevent a potential attack per se but notify your friends and family that you are in a dangerous situation. It is expected that the smart ring leads to the realization of "Affordable Healthcare, Any place, Anytime, Anyone".

A discrete way to check your incoming calls and messages without taking your phone out and disturb the things you are doing, is the Smarty Ring. With this fashion item you can control your phone without touching it, get real time updates from social network Face book, Twitter, Hangout & Skype, trigger the camera, control your music, track your phone and check the time.

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