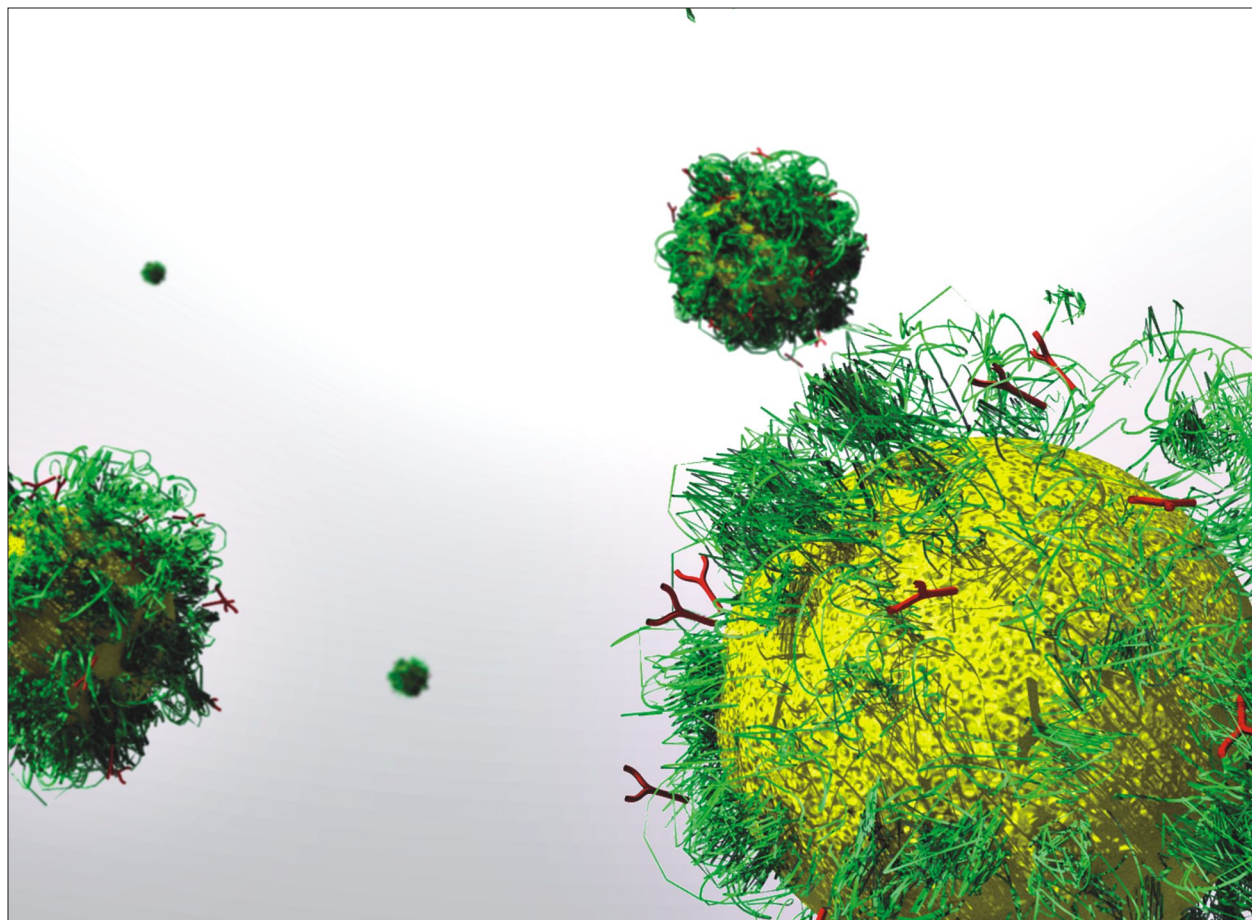




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Medical Super Sensor for Drug Delivery of Cancer Monitoring System Using Improved Particle Swarm Optimization

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ABSTRACT

The recent trend of advanced concept in wireless sensor network is human health care system. It has sensed the various human bodies for diagnosing the disease. In this fact drug delivery is one of factor to inject drug in to the human body and finding the cancer cells. In this case, the doctor can take the complex effort to diagnose the cells and demolished by the drugs. This kind of complexity has been avoided by the sensor networks. The Medical Super Sensor (MSS) is the sophisticated sensor is integrated with Improved Particle Swarm Optimization (IPSO) algorithm to detect the drugs where it has reached to the appropriate damaged cells or not. This algorithm had used to find the position to delivery of drug into the human body. If the signal has transmitted to the body using with the MSS sensor, then the drugs have properly injected and circulating in the body. Doctor could monitor the process in the system and alarm indicates to doctor where it has been reached to appropriate position. The MSS sensor has more memory for storing the data about the patient record in the world. The results of the problems were carefully studied and discussed these issues for giving one short of remedies to the doctors.

Key words: Medical super sensor, improved particle swarm optimization, wireless sensor networks, health care system, drug delivery

INTRODUCTION

Due to advancement in technology, the wireless sensor networks have used large number of applications. Medical sensors are merges as wireless sensor networks in healthcare. The cost and size of sensor networks are reducing fast. Social issues in WSN with health care perspective defined wearable and non-wearable sensor devices humans can be tracked and monitored. Healthcare sensor networks applications have a bright future and it is necessary to take up these issues at the earliest (Al-Ameen and Kwak, 2011). Wearable sensor for Remote Healthcare Monitoring system specified that the important role of body sensor networks in medicine to minimize the need for caregivers and help the chronically ill and elderly people live an independent life, besides providing people with quality care (Kumar *et al.*, 2012). An Efficient algorithm for secure transmission of heart diagnosis data and drug delivery using WSN defined that transmitting and handing with a large scale of data from body sensor consume a lot of communication resource, bring a burden to the remote server and delay the decision time and notification time. Network security is the most vital component in information security because it is responsible for securing all information passed

through networked computers (Rout *et al.*, 2013). A hospital healthcare monitoring system stated that several wireless relay nodes which are responsible for relaying the data sent by coordinator node and forward them to the base station. The main advantage of this system in comparison to previous systems is to reduce the energy consumption to prolong the network lifetime, speed up and extend the communication coverage to increase the freedom for enhance patient quality of life (Aminian and Naji, 2013).

Reliable clinical monitoring using WSN defined that real time patient monitoring is required wired patient monitoring equipment in Intensive care units and reliable wireless clinical monitoring for general hospital units (Chipara *et al.*, 2012). Real time Multi-patient monitoring system using with the Doctor is continuously connected to the ARM server using GSM Module and they can get a record of a particular patient's information by just posting a SMS message to the centralized ARM server. This will reduce treatment time, cost and power consumption to a great extent (Sirisha *et al.*, 2013). An integrated dataset for in silico drug discovery demonstrate that information in this dataset allows known repositioning examples to be discovered and also propose a means of automating the search for new treatment indications of existing compounds (Cockell *et al.*, 2010; Wishart *et al.*, 2006). Changes in and shortcomings of drug stockpiling, vaccine development and related policies during outbreaks of avian influenza A H5N1, H1N1 and H7N9 among humans results indicated that the response to pandemic influenza outbreaks has improved markedly in terms of stockpiles of antivirals and vaccine development (Mei *et al.*, 2013). The diffusion of science driven drug discovery, organizational change in pharmaceutical research paper explores this context of one particularly interesting practice, the adoption of science driven drug discovery by the modern pharmaceutical industry. Over the past two decades, the established pharmaceutical industry has slowly shifted towards is more science-oriented drug discovery approach (Cockburn and Henderson, 1999). Single cell transcriptomics of hypothalamic warm sensitive neurons that control core body temperature and fever response: Signaling asymmetry and an extension of chemical neuroanatomy defined that the functional cellular and *in vivo* studies on dozens of the more than 500 neurotransmitters, hormone receptors and ion channels, whose DNA was identified and sequence confirmed, suggest little or no discrepancy between the transcriptional and functional data in WSNs (Eberwine and Bartfai, 2011). Particle swarm optimization for time-difference-of-arrival based localization shown the PSO approach provided accurate source location estimation for both known and unknown propagation speed and also gives an efficient speed estimate in the latter case (Lui *et al.*, 2007). Hence the Medical Super sensor device has improved the performance for diagnosing the cancer disease using with Improved Particle Swarm Optimization technique. The MSS has used to apply all type of diseases and finally it produced the best results compare to other sensor devices.

MATERIALS AND METHODS

Proposed approach: The study proposed approach was used to diagnose the disease of human body in terms human body affected by cancer. Each cell was identified and also find which are the cells are affected by cancer disease. Once cells were diagnosed, then the antibiotics drug injected into the body for reaching to appropriate damaged cells. This was very difficult to find without scanner system. In this case the Wireless sensor device was used to attach anywhere of the human body. The Medical Super Sensor (MSS) was one the device attached to the body and the process

of the sensor device by the IPSO algorithm has used to search the appropriate location for injecting drug in the position of human body. This algorithm has used to configure with the MSS sensor and attached to the system. This process has been very useful to doctors and who are going to insert antibiotic drug into the body. The drug was discovered in the appropriate cells, the sensor device indicate the successful alarm message to the doctors. The complexity of the problem has been avoided based on this process. The MSS sensor has more memory for storing the data when the cells are absorbed by the drugs. This purpose of the study minimized the cost and difficult to identify the drug has been solved. The IPSO algorithm optimized the every location and indicate the position where the drug it appropriate in human body. The results suggest a strong potential for WSN to open new research area of low cost and ad hoc implementation of multimodal sensors for improving the quality of medical care.

Improved PSO algorithm: The particle swarm optimization has assigned a best algorithm for identifying the local body by determining its minimum angular distance in the current positions. The overall function of this problem are optimized and find the exact soluton for appropriate location. The function can be defined as $f(x_i)$ and the nodes are $f(x_1, x_2, \dots, x_n)$ and also it represents how the Particles's position in the multidimensional space is releatively to the desired goal. Figure 1 shown that how original swarm has optimized in the particular celss and the position is searching in the appropriate positions where the cells are affected by disease. The positions are identified when the cells are damaged otherwise the particular swarm has been discarded. With this problem the improved PSO algorithm shows that how the cells were identified at the rate of cancer cells and also binds the d dimesnsions to be optimized for given a problem modeled as an optimization one of dimensions d. Each particle has a position can be defined in the Eq. 1 and 2:

$$x_{i,d}(it+1) = x_{i,d}(it) + u_{i,d}(it+1) \quad (1)$$

and:

$$\begin{aligned} u_{i,d}(it+1) = & u_{i,d}(it) \\ & + C_1 * \text{Rnd}(0,1) * [p^{b_{i,d}}(it) - x_{i,d}(it)] \\ & + C_2 * \text{Rnd}(0,1) * [g^{b_d}(it) - x_{i,d}(it)] \end{aligned} \quad (2)$$

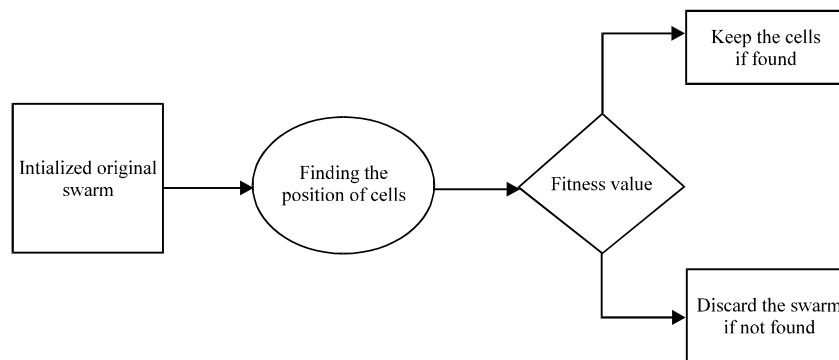


Fig. 1: Positioning the cells in the human body

Algorithm: Improved PSO algorithm

Step 1: For i= 1 to s each particle in each dimension D do

$x_{i,d} = \text{Rnd}(x_{\min}, x_{\max})$

$u_{i,d} = \text{Rnd}(-v_{\min}/3, v_{\max}/3)$

End for

Step 2: While maximum number of cycles has not been reached Do

Update the new positions of the particles $xt+1[i]$ bitwise: For $l = 1$ to L

Calculate the threshold value

If $(\text{rand}() < w)$ then $xt+1[i] - [l] = 1$

else $xt+1, [i] - [l] = 0$

Step 3: Evaluate the fitness of each of the new particles in cells

Update the position p for assigning the best of each particle

Step 4: Initial position is assigned with $seq = i$, $Packet = ai$ and $ack = i$

$P_i^b = x_i$

If $(P_i^b) < f(gb)$ and if $(a_i = x_i)$ then//where P_i^b is the exact position and gb is the same length of the appropriate position

$gb = P_i^b$

$seq = 1$

$ack = 1$

else

message" No damaged cell is found"

$seq = 0$

$ack = 0$

end if

Step 5: For $i = 1$ to S in each particle do

if $(f(x_i) < f(p_i^b))$ and $(\text{maximum Frequency} = \text{frequency})$ then

$P_i^b = x_i$

position = maximum Frequency

maximum Frequency++

If $(P_i^b) < f(gb)$ and $(\text{maximum Frequency} = \text{frequency})$ then

$gb = P_i^b$

global position = maximum Frequency

maximum Frequency++

Step 6: For each particle i in S do for each dimension d in D do

$u_{i,d} = u_{i,d} + C_1 * \text{Rnd}(0,1) * [p_{i,d}^b - x_{i,d}] + C_2 * \text{RND}(0,1) * [g^b - x_{i,d}]$

$x_{i,d} = x_{i,d} + u_{i,d}$

end for

end for

Step 7: Store the position of the particles that represent exact cell positions vectors in the human body

where, I is particle's index, used as a particle identifier, d is dimension being considered, each particle has a position and a velocity for each dimension it is iteration number, the algorithm is iterative, $x_{i,d}$ is position of particle i in dimension d , $v_{i,d}$ is velocity of particle i in dimension d , C_1 is acceleration constant for the cognitive component, Rnd is stochastic component of the algorithm, a random value between 0 and 1, $P_{i,d}^b$ is the location in dimension d with the best fitness of all the visited locations in that dimension of particle i , C_2 is acceleration constant for the social component.

Medical super sensor: The MSS sensor used a radio frequency to make communication with other body sensors and IPSO was used as a protocol to communicate to the human body. The MSS

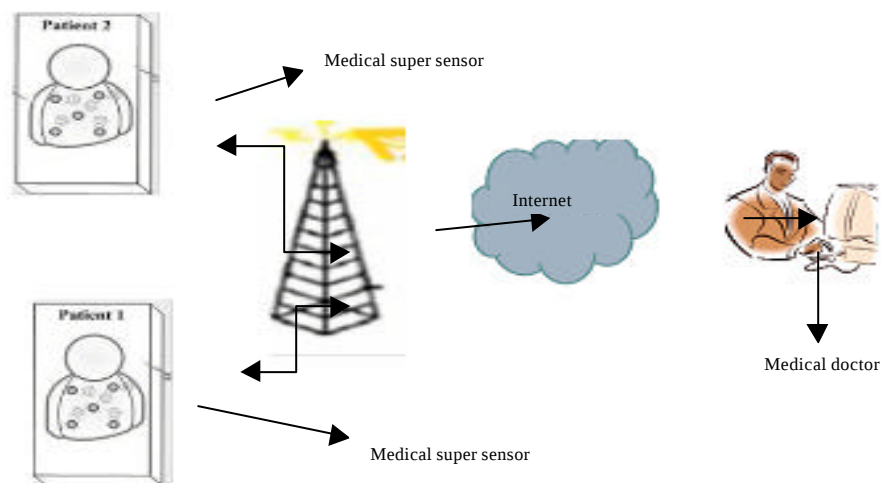


Fig. 2: Architecture of medical super sensors for remote healthcare monitoring system

collects samples with multiple sensed vital signs by the body sensor. If it is programmed to detect cancer, the substance is an antibody that is sensitive to certain proteins identified as indicative of cancer. If the target is glucose, the reactive molecules are composed of zinc oxide nanorods that bind with glucose enzymes. When a reaction occurs, the change on the semiconductor devices has been changed. Due to inefficiency of intake in the human body like Sweet, starchy foods like sugar and white bread probably cause endometrial cancer. The body is made up of trillions of living cells. These cells grow, divide and die in an orderly fashion. This process is tightly regulated and is controlled by the DNA machinery within the cell. In this case the Medical Super sensor has to be attached into the human body and find the cells affected by cancer. Figure 2 shows that how the signal positions are passed to the human body through MSS sensor device and also how the position has to be identified in every cell.

Cancer detection: National Centre for Health Statistics in their annual report stated that about 9 million cancer patients were diagnosed in 1999 and the number is increasing every year. Cancer is now one of the biggest threats to the human life (Kumar *et al.*, 2012).

RESULTS AND DISCUSSION

The simulation results have done in MATLAB. The purpose of the cancer increased in every year defined based on the results, the patients who took the intake of food. Figure 3 shows that the cancer patient has increased rapidly every year. Before in the year was 1995, the population area has very less and also affected by the cancer was very less. After 1995 the patient increased rapidly with various diseases. One of the diseases affected by the human body was cancer at 25%. It has grown in the regular interval of the year 2000, 2005, 2010 and 2013 are 35, 45, 50 and 75, respectively. The most of the case the cancer was affected in the year 2013. It will be increased from 2013. Figure 3 shown that the increase of the cancer level indicated with bar diagram. Figure 4 shows that the measurement of reliability for IPSO algorithm using with human body. It also indicate that how the location can find and insert the drugs into human body. The reliability were measure 0, 10, ... 100% and also the IPSO algorithm has found the position with same

Table 1: Comparison of MSS sensor with the efficiency of other sensor device using IPSO

Disease	Electro cardiograph sensor	Electro myogram sesnor	Electro enphalogram sensor	Medical super sensor
Heart	Yes	No	No	Yes
Blood pressure	Yes	No	No	Yes
Breathing	No	Yes	No	Yes
Muscle activity	No	Yes	No	Yes
Brain	No	No	Yes	Yes
Cancer	No	No	No	Yes
Improved PSO algorithm	Low	Low	Low	High

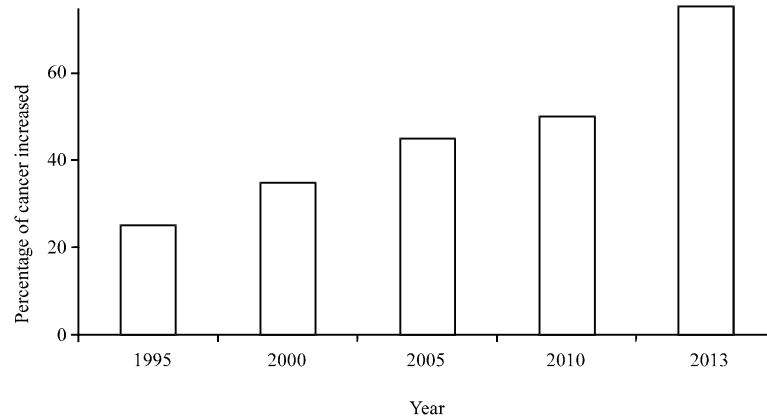


Fig. 3: Percentage of cancer increased by every year

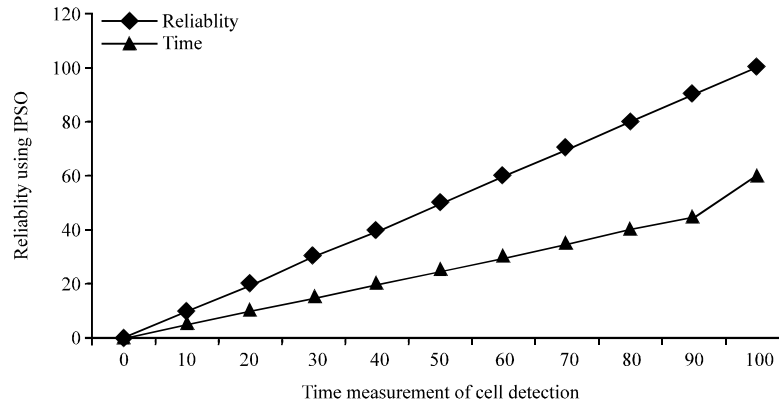


Fig. 4: Time measurement for reliability of IPSO in cell detection

reliability measurement. In this scenario, the time measurements were calculated for finding of the position that was affected by the cancer. So that it was calculated based on the reliability percentages. If the percentage is 10, then it has detected with 5 min. That is when the drug has injected into the body, the IPSO algorithm find the location within the time limitations. Similarly it has calculated 20% of reliability was 10 min.

Table 1 shown that MSS sensor has compared to all other sensor devices. Each sensor device has its own functionality. They were not used for diagnosing with all other diseases. For example Electro Cardio Graph (ECG) sensor has used to find the Blood pressure and cardio problem

has been arrived. The Electro Myogram sensor (EMS) has used to find the breathing and muscular activity. The efficiency of the IPSO algorithm has been checked in all the sensors but except MSS rest of the sensors are very less efficiency. The MSS sensor was the best sensor which has attached to the human body; it has found all the diseases that will be affected in human body. The efficiency of finding the cancer and other disease using with IPSO algorithm has sophisticated best compare to all other sensors. Table 1 shown the efficient with Yes/No implementation of all the sensors using with IPSO algorithm.

CONCLUSION

This study has mainly discussed about drug delivery into the body that are affected by human body. The proposed approach of the study discussed about the reliability of Medical Super Sensor device integrated with IPSO algorithm. The reliability and efficiency of MSS sensor were discussed and compared with all other sensor devices which are affected by any diseases in the human body. The result of the paper has shown the MSS was best sensor compared to all other sensor devices, because it was used for diagnosing all the diseases. From the utilization of the work has found that MSS has been reduced the complexity of doctor's work in the hospitals.

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