A

Seminar report

On

Biochips

Submitted in partial fulfillment of the requirement for the award of degree of Bachelor of Technology in Computer Science

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Acknowledgement

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Preface

I have made this report file on the topic **Biochips;** I have tried my best to elucidate all the relevant detail to the topic to be included in the report. While in the beginning I have tried to give a general view about this topic.

My efforts and wholehearted co-corporation of each and everyone has ended on a successful note. I express my sincere gratitude to …………..who assisting me throughout the preparation of this topic. I thank him for providing me the reinforcement, confidence and most importantly the track for the topic whenever I needed it.

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INTRODUCTION

Most of us won't like the idea of implanting a biochip in our body that identifies us uniquely and can be used to track our location. That would be a major loss of privacy. But there is a flip side to this! Such biochips could help agencies to locate lost children, downed soldiers and wandering Alzheimer's patients.

The human body is the next big target of chipmakers. It won't be long before biochip implants will come to the rescue of sick, or those who are handicapped in someway. Large amount of money and research has already gone into this area of technology.

Anyway, such implants have already experimented with. A few US companies are selling both chips and their detectors. The chips are of size of an uncooked grain of rice, small enough to be injected under the skin using a syringe needle. They respond to a signal from the detector, held just a few feet away, by transmitting an identification number. This number is then compared with the database listings of register pets.

Daniel Man, a plastic surgeon in private practice in Florida, holds the patent on a more powerful device: a chip that would enable lost humans to be tracked by satellite.

BIOCHIP DEFINITION

A biochip is a collection of miniaturized test sites (micro arrays) arranged on a solid substrate that permits many tests to be performed at the same time in order to get higher throughput and speed. Typically, a biochip's surface area is not longer than a fingernail. Like a computer chip that can perform millions of mathematical operation in one second, a biochip can perform thousands of **biological operations,** such as decoding genes, in a few seconds.

A genetic biochip is designed to "freeze" into place the structures of many short strands of DNA (deoxyribonucleic acid), the basic chemical instruction that determines the characteristics of an organism. Effectively, it is used as a kind of "test tube" for real chemical samples.

A specifically designed microscope can determine where the sample hybridized with DNA strands in the biochip. Biochips helped to dramatically increase the speed of the identification of the estimated 80,000 genes in human DNA, in the world wide research collaboration known as the **Human Genome Project.** The microchip is described as a sort of "word search" function that can quickly sequence DNA.

In addition to genetic applications, the biochip is being used in toxicological, protein, and biochemical research. Biochips can also be used to rapidly detect chemical agents used in biological warfare so that defensive measures can be taken.

Motorola, Hitachi, IBM, Texas Instruments have entered into the biochip business.

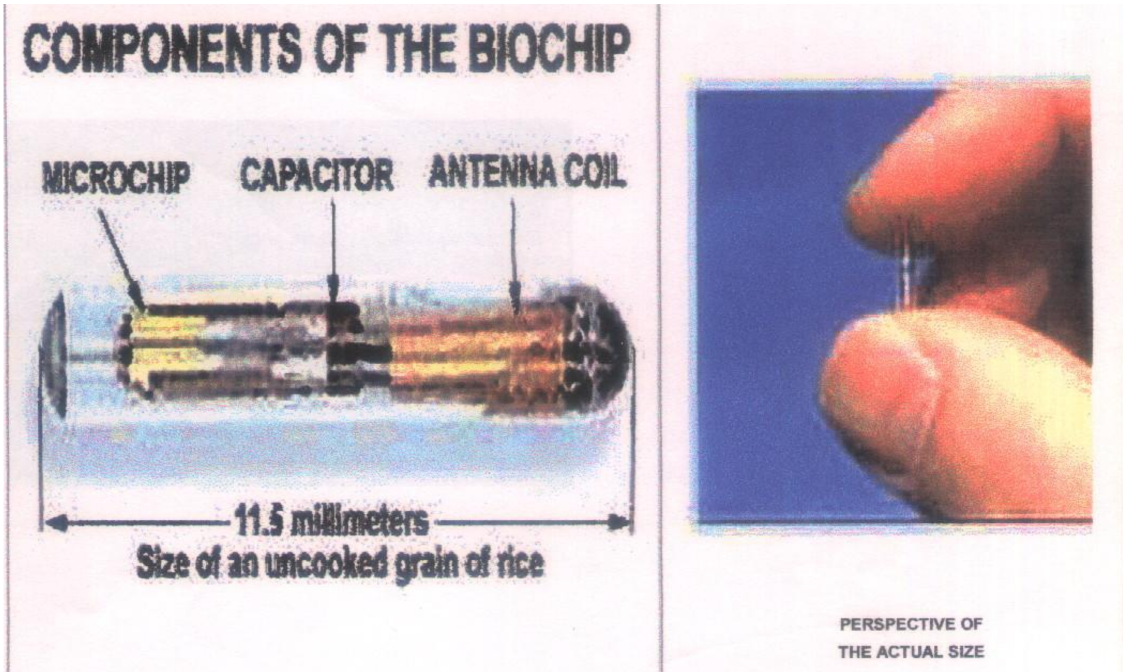
STRUCTURE AND WORKING OF AN ALREADY IMPLANTED SYSTEM

The biochip implants system consists of two components: **a transponder and a reader or scanner.** The transponder is the actual biochip implant. The biochip system is radio frequency identification (**RFID)** system, using low-frequency radio signals to communicate between the biochip and reader. The reading range or activation range, between reader and biochip is small, normally between 2 and 12 inches.

The transponder

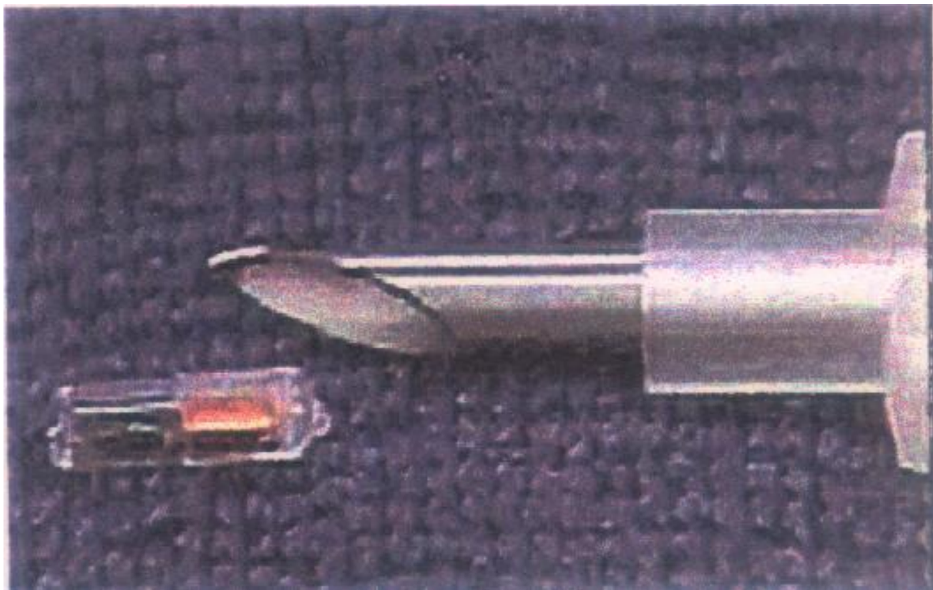
The transponder is the actual biochip implant. It is a **passive** transponder, meaning it contains no battery or energy of its own. In comparison, an active transponder would provide its own energy source, normally a small battery. Because the passive contains no battery, or nothing to wear out, it has a very long life up to 99 years, and no maintenance. Being passive, it is inactive until the reader activates it by sending it a low-power electrical charge. The reader reads or scans the implanted biochip and receives back data (in this case an identification number) from the biochips. The communication between biochip and reader is via **low-frequency radio waves.** Since the communication is via very low frequency radio waves it is nit at all harmful to the human body.

The biochip-transponder consists of four parts; **computer microchip, antenna coil, capacitor and the glass capsule.**



Computer microchips

The microchip stores a unique identification number from 10 to 15 digits long. The storage capacity of the current microchips is limited, capable of storing only a single ID number. AVID (American Veterinary Identification Devices), claims their chips, using a nnn-nnn-nnn format, has the capability of over 70 trillion unique numbers. The unique ID number is “etched” or encoded via a laser onto the surface of the microchip before assembly. Once the number is encoded it is impossible to alter. The microchip also contains the electronic circuitry necessary to transmit the ID number to the “reader”.



BIOCHIP & SYRINGE

Antenna Coil

This is normally a simple, coil of copper wire around a ferrite or iron core. This tiny, primitive, radio antenna receives and sends signals from the reader or scanner.

Tuning Capacitor

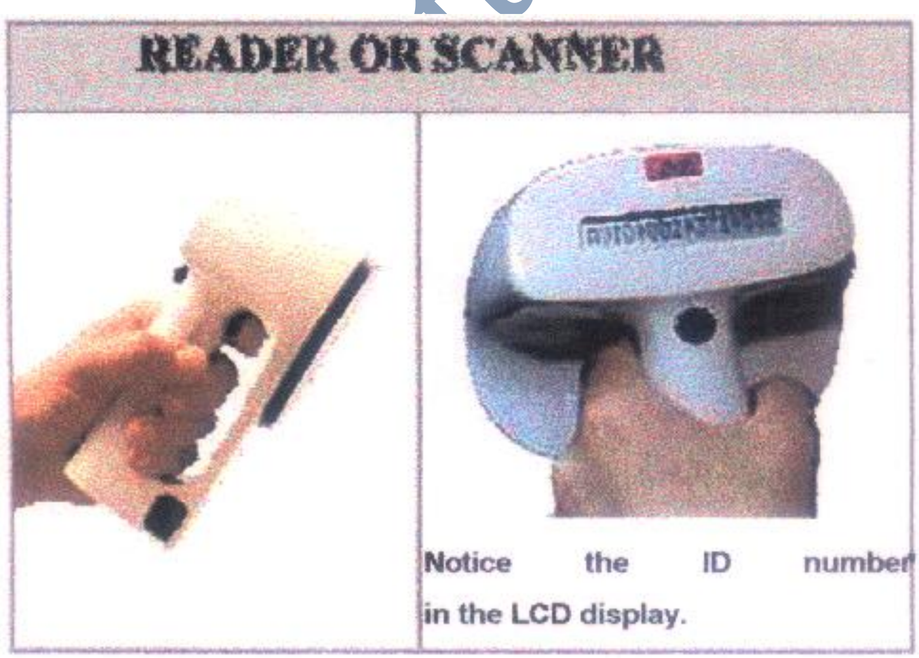
The capacitor stores the small electrical charge (less than 1/1000 of a watt) sent by the reader or scanner, which activates the transponder. This “activation” allows the transponder to send back the ID number encoded in the computer chip. Because “radio waves” are utilized to communicate between the transponder and reader, the capacitor is tuned to the same frequency as the reader.

Glass Capsule

The glass capsule “houses” the microchip, antenna coil and capacitor. It is a small capsule, the smallest measuring 11 mm in length and 2 mm in diameter, about the size of an uncooked grain of rice. The capsule is made of **biocompatible material** such as soda lime glass.

After assembly, the capsule is hermetically (air-tight) sealed, so no bodily fluids can touch the electronics inside. Because the glass is very smooth and susceptible to movement, a material such as a polypropylene polymer sheath is attached to one end of the capsule. This sheath provides a compatible surface which the **boldly tissue fibers bond or interconnect,** resulting in a permanent placement of the biochip.

The biochip is inserted into the subject with a hypodermic syringe. Injection is safe and simple, comparable to common vaccines. Anesthesia is not required nor recommended. In dogs and cats, the biochip is usually injected behind the neck between the shoulder blades.



The reader

The reader consists of an “**exciter coil”** which creates an electromagnetic field that, via radio signals, provides the necessary energy (less than 1/1000 of a watt) to “**excite” or “activate”** the implanted biochip. The reader also carries a receiving coil that receives the transmitted code or ID number sent back from the “activated” implanted biochip. This all takes place very fast, in milliseconds. The reader also contains the software and components to decode the received code and display the result in an LCD display. The reader can include a RS-232 port to attach a computer.

How it works

The reader generates a low-power, electromagnetic field, in this case via radio signals, which “activates” the implanted biochip. This “activation” enables the biochip to send the ID code back to the reader via radio signals. The reader amplifies the received code, converts it to digital format, decodes and displays the ID number on the reader’s LCD display. The reader must normally be between 2 and 12 inches near the biochip to communicate. The reader and biochip can communicate through most materials, except metal.

BIOCHIPS CURRENTLY UNDER DEVELOPMENT

1. **Chips that follow footsteps**
2. **Glucose level detectors**

Chips that follow footsteps

The civil liberties debate over biochips has obscured their more ethically benign and medically useful applications. Medical researchers have been working to integrate chips and people for many years, often plucking devices from well known electronic appliances. Jeffry Hausdorff of the Beth Israel Deaconess Medical Center in Boston has used the type of pressure sensitive resistors found in the buttons of a microwave oven as stride timers. He places one sensor in the heel of a shoe, and one in the toe, adds a computer to the ankle to calculate the duration of each stride.

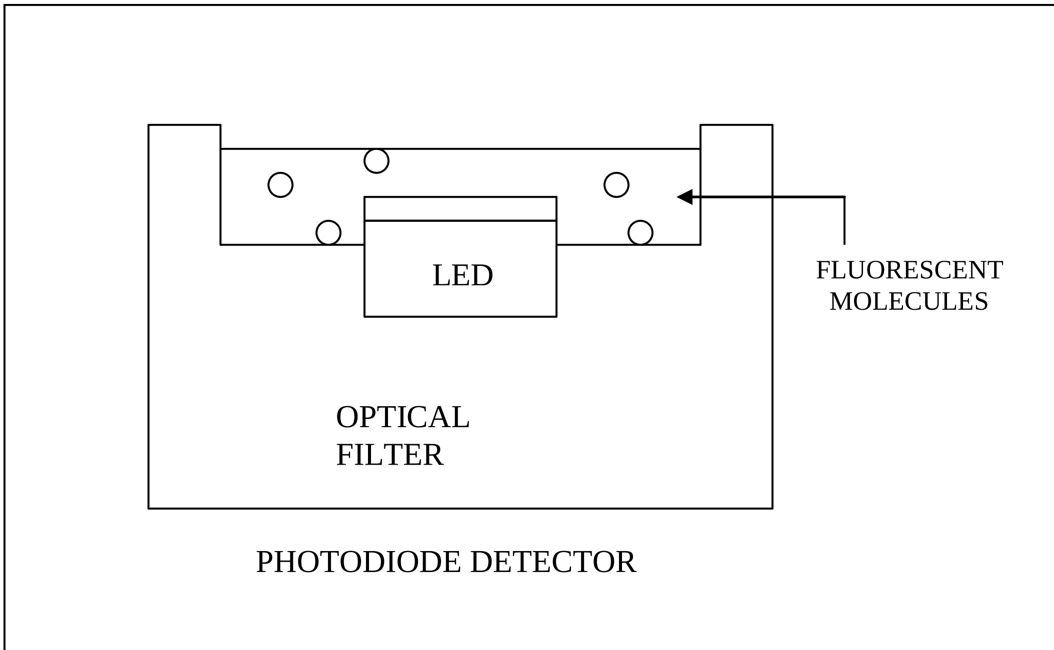
"Young, healthy subjects can regulate the duration of each step very accurately," he says. But elderly patients prone to frequent falls have extremely variable stride times, a flag that could indicate the need for more strengthening exercises or a change in medication. Hausdorff is also using the system to determine the success of a treatment for congestive heart failure. By monitoring the number of strides that a person takes, can directly measure the patient's activity level, bypassing the often-flowed estimate made by the patient.

Glucose level detectors

Diabetics currently use a skin prick and a handheld blood test, and then medicate themselves with the required amount of insulin. The system is simple and works well, but the need to draw blood means that most diabetics do not test themselves as often as they should. The new S4MS chip will simply sit under the skin, sense the glucose level, and send the result back out by radio frequency communication.

A light emitting diode starts off the detection process. The light that it produces hits a fluorescent chemical: one that absorbs the incoming light and re-emits it at a longer wavelength. The longer wavelength of light is detected, and the result is send to a control panel outside the body. Glucose is detected because the sugar reduces the amount of light that a fluorescent chemical re-emits. The more glucose is there the less light that is detected.

S4MS is still developing the perfect fluorescent chemical, but the key design innovation of the S4MS chip has been fully worked out. The idea is simple: the LED is sitting in a sea of fluorescent molecules. In most detectors the light source is far away from the fluorescent molecules, and the inefficiencies that come with that mean more power and larger devices. The prototype S4MS chip uses a 22 microwatt LED, almost forty times less powerful than a tiny power-on buttons on a computer keyboard. The low power requirements mean that energy can be supplied from outside, by a process called induction. The fluorescent detection itself does not consume any chemicals or proteins, so the device is self sustaining.



THE S4MS CHIP SENSING OXYGEN OR GLOUCOSE

Typical Problem Of BIOCHIPS

- A chip implant would contain a person's financial world, medical history health care — it would contain his electronic life.
- If cash no longer existed and if the world's economy was totally chip oriented; — there would be a huge "black-market" for chips! Since there is no cash criminals would cut off hands and heads, stealing "rich-folks" chips.
- It is very dangerous because once kidnappers get to know about these chips, they will skin people to find them,"

Advantages

1. To rescue the sick
2. To find lost people.
3. To locate downed children and wandering Alzheimer's Patients.
4. To identify person uniquely.
5. They can perform thousands of biological reactionsoperations in few seconds.
6. In monitoring health condition of individuals in which they are specifically employed.
7. They can perform thousands of biochemical reactions.

Disadvantages

1. They raise critical issues of personal privacy.

2. They mark the end of human freedom and dignity.

3.They may not be supported by large % of people.

4. There is a danger of turning every man, women, and
Child into a controlled slave.

5. Through cybernitic biochip implants people will think and act as exactly pre-programmed.

6. They can be implanted into one's body without their knowledge.

CONCLUSION

- Infotech will be implanted in our bodies.
- A chip implanted somewhere in human bodies might serve as a combination of credit card, passport, driver's license, personal diary.
- No longer would it beneeded to worry about losing the credit cards while traveling.
- A chip inserted into human bodies might also give us extra mental power.
- The really fascinating idea is under fast track research "but we're close.”
- The day in which we have chips embedded in our skins is not too far from now.

REFERENCES

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