Bio Chip DNA Sensing Method by using Embedded Technology

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***Abstract*:"A single electronic card may replace everything in your wallet including. your cash your credit cards , your ATM card,your ID cards, your insuranceand your life. FUTURE One card, or one chip, with your life on it." "Biochips"The most exciting future technology is an outcome of the fields of Computer science, Electronics & Biology. It is a new type of bio- security system to accurately track information regarding what a person is doing, and who is to accurately track information regarding what he is doing, and who is actually doing it. It's no more required with biochips the good old idea of remembering pesky PINs, Passwords, & Social security numbers .No more matters of carrying medical records to a hospital, No more cash/credit card carrying to the market place; everything goes embedded in the chip. Everything goes digitalized. No more hawker tricks on the internet. Biochip has a variety of technique for secured E-money transactions on the net. The power of biochips exists in capability of locating lost children, downed soldiers, and wandering Alzheimer patients.**

I. HISTORY

The development started with early work on the underlying sensor technology. One of the first portable, chemistry-based sensors was the glass pH electrode, invented in 1922 by Hughes In subsequent years. For example, a K^+ sensor was produced by incorporating valinomycin into a thin membrane.

In 1953, Watson and Crick announced their discovery of the now familiar double helix structure of DNA molecules and set the stage for genetics research that continues to the present day The development of sequence techniques in 1977 by Gilbert and Sanger (working separately) enabled researchers to directly read the genetic codes that provide instructions for protein synthesis. This research showed how hybridization of complementary single oligonucleotide strands could be used as a basis for DNA sensing. Two additional developments enabled the technology used in modern DNA-based. First, in 1983 Kary Mullis invented the polymerase chain reaction (PCR) technique method for amplifying DNA concentrations. This discovery made possible the detection of extremely small quantities of DNA in samples. Secondly in 1986 Hood and co-workers devised a method to label DNA molecules with fluorescent tags instead of radiolabelsthus enabling hybridization experiments to be observed optically.

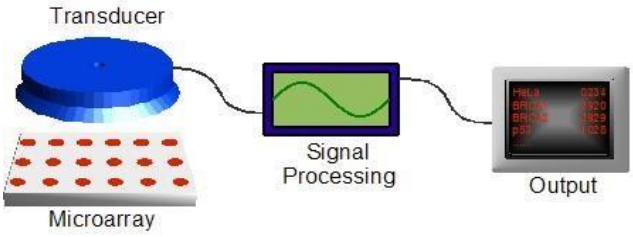


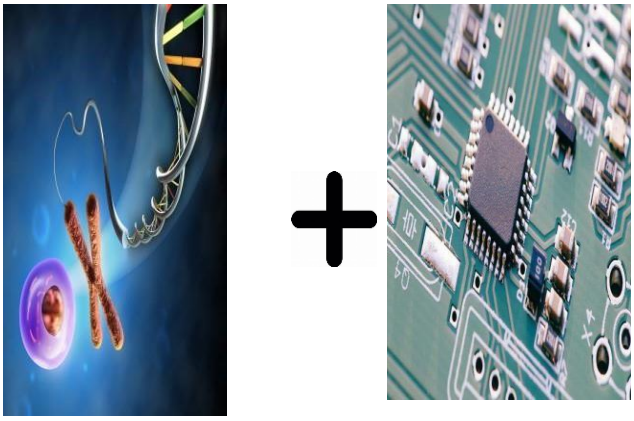
Figure 1. Biochips

Figure 1 shows the makeup of a typical biochip platform. The actual sensing component (or"chip") is just one piece of a complete analysis system. Transduction must be done to translate the actual sensing event (DNA binding, oxidation/reduction, *etc.*) into a format understandable by a computer (voltage,light intensity, mass, *etc.*), which then enables additional analysis and processing to produce a final, human-readable output. The multiple technologies needed to make a successful biochip—from sensing chemistry, to microarraying, to signal processing—require a true multidisciplinary approach, making the barrier to entry steep. One of the first commercial biochips was introduced by Affymetrix. Their "GeneChip" products contain thousands of individual DNA sensors for use in sensing defects, or single nucleotide polymorphisms (SNPs), in genes such as p53 (a tumor suppressor) and BRCA1 and BRCA2 (related to breast cancer). The chips are produced using microlithography techniques traditionally used to fabricate integrated circuits.

II. INTRODUCTION

Biochips are any microprocessor chips that can be used in Biology. The biochip technology was originally developed in 1983 for monitoring fisheries, it's use now includes, over 300 zoos, over 80 government agencies in at least 20 countries, pets (everything from lizards to dogs), electronic "branding" of horses, monitoring lab animals, fisheries, endangered wildlife, automobiles, garment tracking, hazardous waste, and humans. Biochips are "silently" inching into humans. For instance, at least 6 million medical devices, such as artificial body parts (prosthetic devices), breast implants, chin implants, etc., are implanted in people each year. And most of these medical devices are carrying a "surprise" guest — a biochip. In 1993, the Food and Drug Administration passed the Safe Medical Devices Registration Act of 1993, requiring all artificial body implants to have "implanted" identification — the biochip. So, the yearly, 6 million recipients of prosthetic

devices and breast implants are "biochipped". To date, over 7 million animals have been "chipped". The major biochip companies are
A.V.I.D. (American Veterinary Identification Devices), Trovan Identification Systems, and Destron-Fearing Corporation.
BIOCHIP=BIO+CHIP
IO stands for any biological entity like DNA,cells etc
CHIP stands for computer chip
It is a mate between biological entity and computer chip



III. DEFINITION

- A Biochip is a collection of miniaturized test sites (microarrays) arranged on a solid substrate that permits many test to be performed at the same time
- A biochip like a computer chip can perform millions of mathematical operations and thousands of biological reactions in few Seconds
- Chips are of the size of uncooked grain of rice small enough to injected under the skin using a syringe needle(hypodermic syringe)

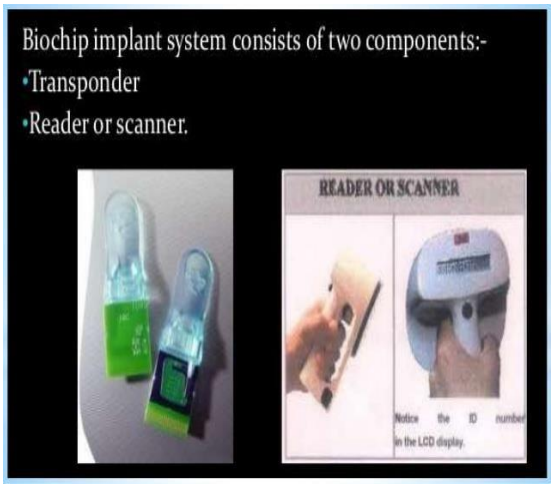
IV. APPLICATIONS

- Tracing of a person or animal anywhere in the world is possible.
- Can store and update financial,medical,demographic data of a person.
- Biochip leads to a secured E-commerce systems.
- Biochips are really potent in replacing passports,cash,medical records.

V. COMPONENTS

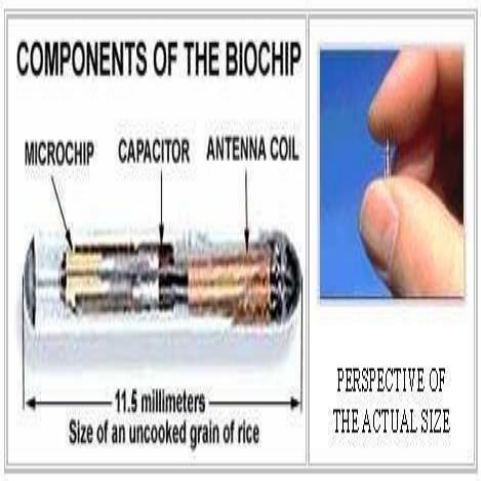
Biochips implant system consists of two components:-

- Transponder
- Reader or scanner



TRANSPONDER:The transponder: The transponder is the actual biochip implant. It isa passive transponder, meaning it contains no battery or energy of it's own. In comparison, an active transponder would provide it's own energy source, normally a small battery. Because the passive biochip contains no battery, or nothing to wear out, it has a very long life, up to 99 years, and no maintenance. Being passive, it's 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 biochip. The communication between biochip and reader is via low-frequency radio waves.
There are two types of Transponder, they are:-

- Activetransponer
- passive transponder Transponder consists of 4 parts, they are:-
- Computer microchip
- Antenna coil
- Tuning capacitor
- Glass capsule



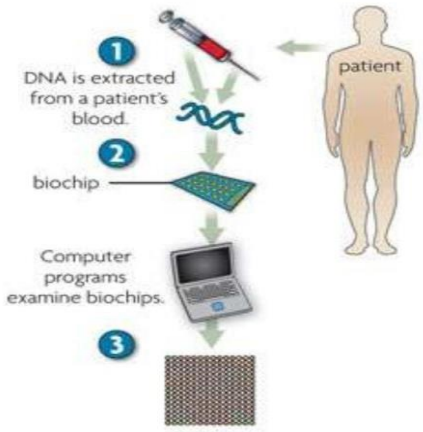
Computer chip:- The microchip stores a unique identification number from 10 to 15.
Antenna:- This tiny,primitive,radio antenna"receives and sends" signal from the reader or scanner.

Tuning Capacitor:-This capacitor is charged by the small(1/1000 of a watt) signal sent by the reader.
Glass capsule:-It is made of biocompatible material such as soda lime glass.

READER OR SCANNER
Consists of an "*EXCITER"* coil which creates electromagnetic field.
Provide energy to *"ACTIVATE"* the implanted biochip.
Also carries a receiving coil to receive ID number.
WORKING
Reader transmits a low -power radio signal and activates the implanted biochip.
ID number transmitted by the transponder and received by the reader.
Reader displays the ID number on the reader's LCD display.

VI. BIOCHIP IMPLANT

- Injected by a hypodermic syringe beneath the skin.
- Injection is safe and simple
- Anesthesia is not required.
- Usually injected behind the neck in dogs and cats



VII. ADVANTAGES

- To rescue the sick.
- To find the lost people.
- To identify the person uniquely.
- In monitoring health condition of individuals in which they are specially employed.
- They can perform thousands of biological reaction in few seconds.
- Increase speed of diagonsis of unknown pathogen.
- Ability to detect multiple viral agents in parallel.

AREA NEED TO BE CONCERNED

- They raise critical issues of personal privacy.
- They mark the end of human freedom and dignity.
- There is danger of turning everyman,women and child into a controlled slave

FUTURE:-

- 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 be needed to worry about losing the credit cards while traveling.
- A chip inserted into human bodies might also gives us extra mental power.

VIII. CONCLUSION

- BIOCHIPS are:
- Fast
- Accurate
- Expected to become economically advantageous attributed that make them analogous to computer chip.

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