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A Review on Micro Electronic Pill

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Abstract: - The purpose of this paper is to provide the information about the innovation of new device called Micro Electronic Pill in the field of Bio-Medical Measurement, this is mainly used for diagnosis of internal part mainly gastrointestinal system which cannot be easily done with the help of normal endoscope. It is modern wireless type of endoscopic monitoring system.

I. INTRODUCTION

The microelectronic pill is a small capsule shaped electronic pill that can be comfortably swallowed by any normal patient. It consists of lens, antenna, transmitters, camera or sensors and battery. It can reach regions such as small intestine and provides the video wirelessly to the receiving device connected to the monitoring system outside the human body and kept at distance of 1 meter. The transmission of data takes place through the radio communication between electronic pill transmitter and external receiver.
Parameters such as temperature, pH and pressure of gastrointestinal tract can be measured, for the detection of diseases and disturbance in gastro intestinal system which prevents the entry of conventional endoscopic tube, a micro pill with single channel radio telemetric function is preferred. The invention of semiconductors provides ease in development of concise electronic pill capable to carry and transmit huge amount of data at a time without affecting the human body. The diagram below represents the wireless video transmission between transmitter and receiver:

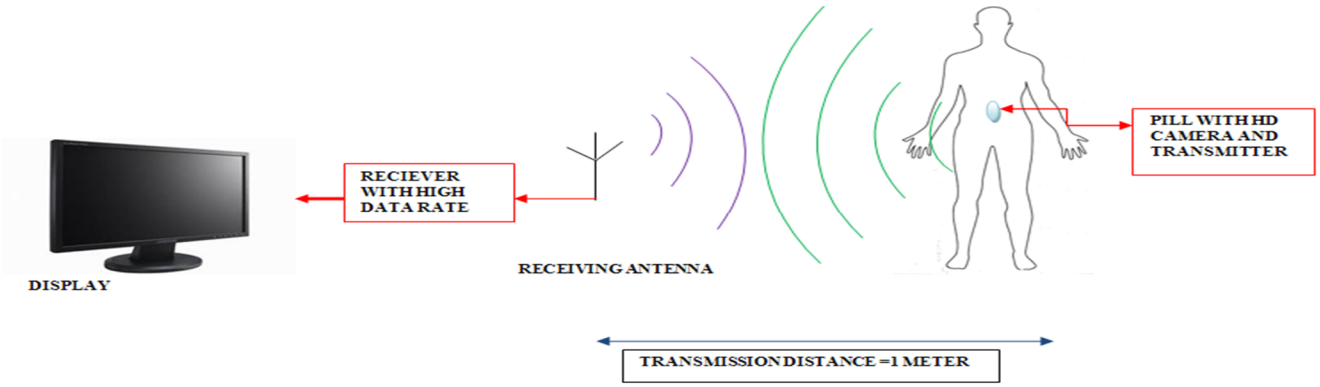

Fig 1:- Wireless Endoscope through Micro Electronic Pill

II. CONSTRUCTION

A Microelectronic pill construction requires narrow band transmission and has limited camera pixels. One of the commercially available endoscopic devices designed by the company “Given Imaging” uses Radio Frequency chip for wireless communication for real time video transmission based on the Medical Implant Communication Service band. The channel bandwidth allowable for this band is limited to 300 kHz; the low frequency application provides high transmission efficiency through layers of skin. It is very much difficult to carry enough data rate for high definition real time video data during real time monitoring process. So, for better real time diagnosis there is requirement of higher bandwidth data transmission. The fabrication of sensors of electronic pill are done on two silicon chips which is generally kept at the top of the capsule and the first chip encompasses diode, the pH ISFET sensor, temperature sensor and conductivity sensor with two sensor. The another chip has thermometer and oxygen sensor.
The method which provides the baud rate of 100Mbps is Wideband Technology. This technology is currently used in radar, Image processing and In-door entertainment. But, the major problem in high frequency is the major loss in

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body tissue. The schematic diagram of pill is represented by the figure below:-

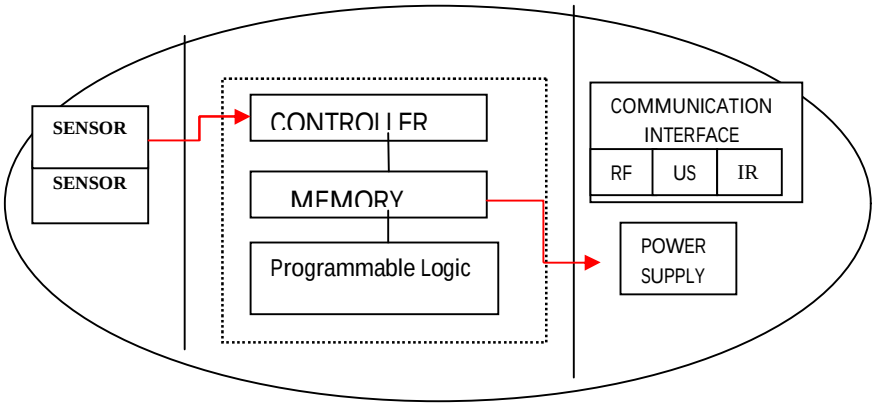

Fig: 2- BLOCK DIAGRAM OF SWALLOWABLE MICRO ELECTRONIC PILL

III. DESCRIPTION

All Microelectronic pill is powered by a battery, in order to utilize the device in internal remote locations. There is scanning receiver which captures the wireless radio signal from pill through a coil antenna. A computer system is required for the control of data acquisition unit which acquires data in analog form from the scanning receiver. It provides recording of data on the computer. Stable transmission frequency must be constantly maintained. The transmission frequency is measured with the help of change in temperature. The change in frequency is measured with the help of scanning receiver, and the result obtained is used to evaluate the advantage of crystal stabilized unit.

The power consumption of microelectronic including transmitter and sensors connected is calculated to 12.1 milliwatt with current rating 3.9mill Ampere at 3.1 volt voltage supply, where as free running radio transmitter consumes 6.8milliwatt.Two silver oxide batteries SR44 are used to provide operating time of more than 40 hours. The pH measurement ranges from 1 to13 can be carried out .The dissolved oxygen is up to 8.2 mg per liter. The temperature measurement is done from 0ºC to 70ºC. The pH ISFET sensor operated in constant current mode, with the drain voltage connected to the positive supply and the source voltage changes as per gate potential and gate potential is grounded. In control chip, the noise from application specific integrated circuit provides a constant level of 3Mega volt peak to peak, which provides single Least Significant Bit of Analog to Digital Convertor; the second Least Significant Bit is used to provide an adequate noise margin, and here to have an effective resolution of 8 bits the 10 –bit Analog to Digital Convertor is used.

The components of capsule must be capable to protect itself from corrosive environment in gastro intestinal tract and it must be non-toxic to the human being but as the battery electrodes are toxic in nature, so care must be taken to prevent leakage of toxic fluids into the digestive system.

IV. ADVANTAGES

A. It is benefiticial to detect the diseases and malfunctioning in the remote areas of gastro intestinal tract just like pancreatic disease, inflammatory bowel disease, activity of fermented bacteria, acidic level and oesophagus reflux which is out of reach for conventional endoscopic device.
B. It can be used in corrosive surrounding of GI tract.
C. It consumes very less power as it operates in Programmable Standby Mode.
D. Its practical application is very simple as it has very small in size.
E. The battery lasts for 40 hours which is sufficient to carry out any type of complete internal diagnosis.
F. The transmission length is limited to a distance of only one meter, so it has zero noise interference.

V. DISADVANTAGES

A. The ultrasonic activities and impedance topographies cannot be performed by this.

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B. It is unable to detect radiation abnormalities.
C. The treatment through Micro Pill is very expensive and is not available in many regions.
D. The size of pill is small but it is not as small that can be digested by small babies.

VI. SUMMARY

Human body is very sensitive even for small changes. Many times the doctors fail to interpret the diseases and abnormalities which make the curing of diseases more difficult, so the Micro Electronic pill is developed by the scientists to overcome from this problem and quick diagnosis is possible by this innovation. To carry out above process efficiently a radio system of high capacity is needed for this technology to get real time video of digestive system wirelessly, this requires Upper Wide Bandwidth Transmitter and Receiver. But tissue damage at high frequency limited its usage. Research work is carried out to get the detailed images of internal parts through high frequency transmission and reception of data without damage to tissues of human body.

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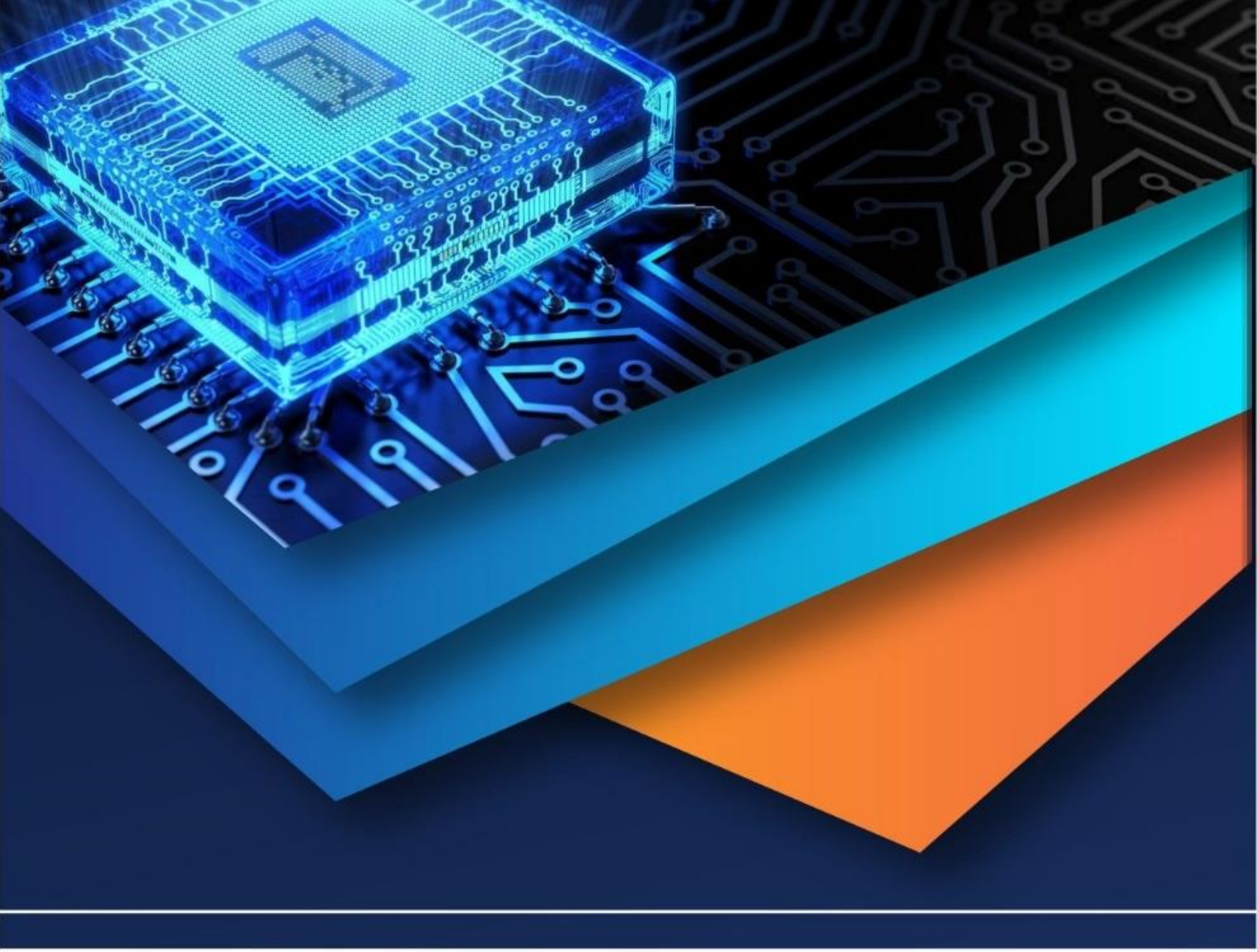

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