

## Wireless Capsule Endoscopy

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### ABSTRACT

*This paper considers the problem of using traditional endoscopy for detection of tumours of small intestine and vascular disorders. Endoscopy is a diagnostic medical procedure that is used to access the interior surface of an organ by inserting a long tube into the body. However endoscopy is a painful procedure and patient requires sedation, involves potential complications, causes patient anxiety discomfort and pain and also requires substantial time commitment. In this paper, the concept of nanotechnology has been used which introduces an inexpensive and beneficial product known as pill camera. 'Pill camera' or Capsule endoscopy is a new diagnostic tool that permits a direct visual examination of the small intestine, an area of the body not previously accessible using upper endoscopy. It has made revolution in field of medicine.*

**Keywords:** Endoscopy, Nanotechnology, Camera Pill, Image processing, CMOS

### I. INTRODUCTION

Endoscopy is a procedure that allows the doctor to examine the state of the upper gastrointestinal tract. It involves the insertion of an endoscope that is a long flexible tube with a camera at the end into the gastrointestinal tract through the mouth. By using the traditional endoscopy there is a high risk of bleeding, infection, tearing of the gastrointestinal tract. In recent years there is a big revolutions in the field of nanotechnology which has played a major role in overcoming these drawbacks. Basically nanotechnology is the domain that is related with the application of sub micron technology. It is a part of science and technology that is related with the control of matter on the atomic and molecular scale i.e., things that are smaller about 100 nanometres .With Nanotechnology, products such as Electronic devices, catalysts, sensors, etc. can be manufactured with very minute dimensions. Nanotechnology has lead to the invention of various application based products at lower cost and greater precision than ever before. One such application of nanotechnology is pill camera. The pill camera is a new diagnostic tool that permits a direct visual examination of the small intestine. It is that area of the body which is not previously accessible using upper endoscopy or colonoscopy. The pill is known as M2A capsule endoscopy. The microelectronic pill is a small shaped

electronic pill that can be completely swallowed by a normal patient.



Fig .1 : Pill Camera

### II. LITERATURE SURVEY

Researchers from the University of Glasgow have found a way to make swallowable cameras more effective at detecting cancers of the throat and gut. In recent years, tiny sensing systems small enough for patients to swallow have proven to be a valuable clinical alternative to more intrusive imaging methods such as endoscopes. Until now, the systems, often known as video-pill, have relied on illuminating patients' innards using a small light source, restricting clinicians to conclusions based on what they can see in the spectrum of visible light.

Dr. Richard Feynman [1] first introduced the technology in order to take pictures of human intestine and transmits the same to the receiver of the Computer analysis of our digestive system. It was then observed that it is possible to manipulate single atoms.

The diagnostic pill was invented in the 1990s by Israeli inventor Gavriel Iddan [2].The year 1981 began with the development of a camera that would fit into a pill. In 2001 the FDA approved the given diagnostic imaging system first capsule named M2A Capsule for small intestine visualization which was a huge revolution in the field of medicine.

Dr. Mohammed Al-Rawhani [3] highlighted on how the traditional endoscopy methods could be harmful to the human body. Since these methods leads to image fluorescence 'phantoms'--mixtures of flavins and haemoglobins which shows closely how cancers are affected by fluorescence in parts of the body like the intestines, the bowel and the Oesophagus .The system could also be used to help track antibodies

creating a new way in detection of cancer.

### III. PROBLEM IDENTIFICATION

Since scope tests were first invented, doctors wanted to visualize the entire gut -all 30 feet. Moreover the push enteroscopy has had only limited success .In addition to this longer instruments were difficult to control, manipulate and hard to maintain. Also a direct view of the small intestine had remained elusive. The results of push enteroscopy of patient is not accurate since the entire small intestine is not visualized. Therefore researchers have made several attempts related with the development of advanced endoscopic instruments which gave rise to the invention of wireless capsule endoscopy.

### IV. PROPOSED METHODOLOGY

The proposed technique of Wireless Capsule Endoscopy is a technique through which the visualization of mucosa of the small intestine, large intestine and oesophageal is possible. Moreover this proposed scheme not only diagnosis the routine tests but also certain conditions that are routinely missed by other tests are also detected at an earlier stage which prevents from further complications of the disease.

The wireless capsule endoscopy consists of a disposable video camera encapsulated into a pill that can be swallowed with water. The size of this pill camera is around 26 X 11 mm .This wireless capsule consists of a clear view that allows the camera to give accurate pictures of the lining of the small intestine. The pill camera as it passes through the small intestine takes numerous high-quality digital images and is capable of transmitting 50,000 colour images during its traversal through the digestive system of patient.

The proposed capsule can work simultaneously wherein it can transmit a video signal and receive a control signal thereby determining its behaviour. The net consumption of power of this capsule can be reduced further by turning off the camera during dead time and separately controlling the LEDs for proper illumination in the intestine. This wireless capsule is capable of transmitting up to maximum seven to eight hours of video. The most important advantage for the patient is that no hospitalization is required. The images thus obtained are then downloaded to a computer workstation and using a software program the further processing is done. The software also provides an image of the pill as it passes through the small intestine which enables the physician to match

the image to the location of the capsule.



Fig .2 : Structure of Pill Camera

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. 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 Transmitter and Receiver sections of the proposed scheme are shown in figure 3 and 4 respectively.

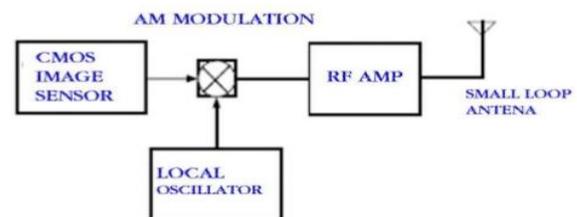


Fig.3 : Transmitter Block Diagram

The CMOS image sensor senses the input signal from the human body which is amplified further by using a RF Amplifier .This amplified signal is transmitted through a small loop antenna.

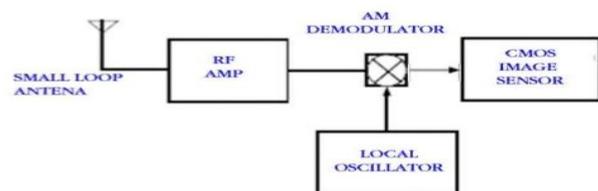


Fig.4 : Receiver Block Diagram

The receiver comprises of on-off superheterodyne receiver .It receives the stream serially and interprets the information. Each bit is used for recognition of the control signals from outside the body.

The overall structure of the entire system is depicted in figure 5 below.

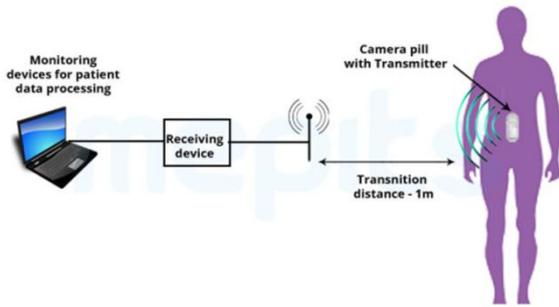


Fig.5 : Overall System Model

## V. CONCLUSION

Though nanotechnology has not evolved to its full capacity yet the various range of products have already made an impact on the market. In the near future most of the conventional manufacturing processes will be replaced with a cost effective and better manufacturing process “nanotechnology”. The proposed technique in the process of endoscopy using a pill camera will be highly beneficial in the domain of biomedical sciences and will help the doctors to diagnose complicated intestinal bowel in an effective and easy way. Moreover this technique will reduce unwanted death rate in near decades.

## REFERENCES

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