JNTUHCEH

DEPARTMENT OF ELECTRONICS AND COMMUNCIATION ENGINEERING(ECE)

TECHNICAL REPORT

RFID – Radio Frequency IDentification

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B-Tech 3rd year.

Preface:

The present report is the outcome of the study based on RFID and its real-life applications. The objective of RFID is automatically identified and track tags attached to objects.

RFID Systems are mainly proposed as an alternative to previously established technologies (E.g: Wi-Fi, GPS Localization). RFID is the trending technology in which everyone should have basic idea about this. So, in this report focuses on RFID, its design, implementation, working and various types of tags. It also gives an idea about various applications of RFID.

ACKNOWLEDGEMENTS

 I am very grateful to the faculty of AECS lab for providing me with an opportunity to explore more about Technical topic of Radio Frequencies.

The report is about RFID and it is an essential methodology used in communications. I would like to thank the faculty of AECS lab for giving me an opportunity to share my findings and research work on RFID.

 I would also like to express my gratitude towards our faculty who added curiosity to learn more about the subject.

I also take this opportunity to express a deep sense of gratitude to all my friends who helped me in exploring more about the subject.

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<u>ABSTRACT</u>

The paper reports on the Design and working Principle of RFID. Usage of RFID in daily life is growing with the primary objective of making efficient use of Radio Frequency and Coupling Principle.

The report presents an overview of RFID, its Design Implementation, Working Principle, various types of tags and the advantages and disadvantages of using each type of RFID tags, this would give an idea about the Applications of RFID.

Introduction

➢ Radio Frequency IDentification: Technology that uses radio frequency waves to transfer data between a reader and a movable item to identify, categorize, track…

➢ RFID is fast, reliable and doesn't require any physical sight or contact between reader/scanner and tagged item.

➢ An RFID tag consists of a tiny radio transponder; a radio receiver and transmitter.

➢ When triggered by an electromagnetic interrogation pulse from a nearby RFID reader device, the tag transmits digital data, usually an identifying inventory number, back to the reader. This number can be used to track inventory goods.

Development of RFID Concept

- The use of RFID technology extends historically to the 1960's, when the first commercial products emerged.

- The Introduction of this technology motivated future research that sought to integrate RFID into various applications ranging from inventory control/monitoring to human/animal tracking
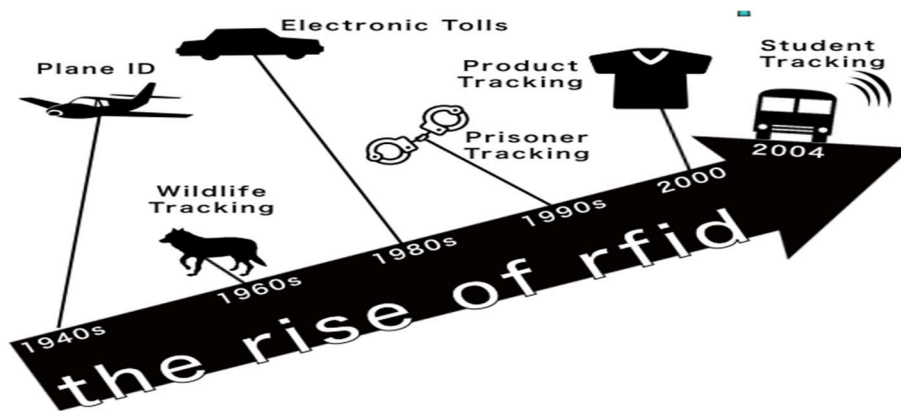
- Watson watt developed the first active Identify Friend or Foe (IFF) system during worldwar-2(1940s-1960s).
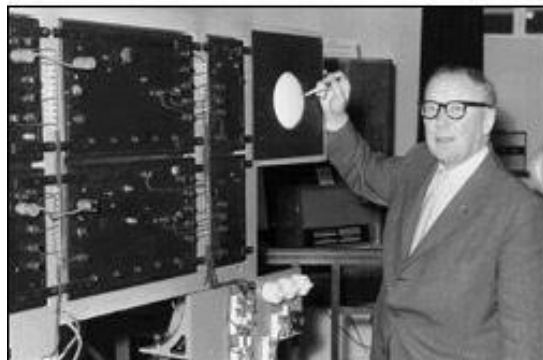
- MarioCardullo receives first patent for passive RFID(1973)
- In the 21st century, Commercial applications of RFID entered the mainstream.
- Now,RFID became part of everyday life and its explosion continues

Key Components of RFID:

- Reader
- Tags
- Host
- Antenna

Tags:

Tags are made of these parts
1. Chips: Hold information about physical object.
2. Antenna: Transmit Radio signal.
3. Package: Encases the chips and antenna, so that tag can be attached to physical object.

Active tags:
- Active Tags Contain a battery that runs the microchip circuitry.
- Tag is able to send a stronger signal top the reader due to battery
  ($20-$40per tag).
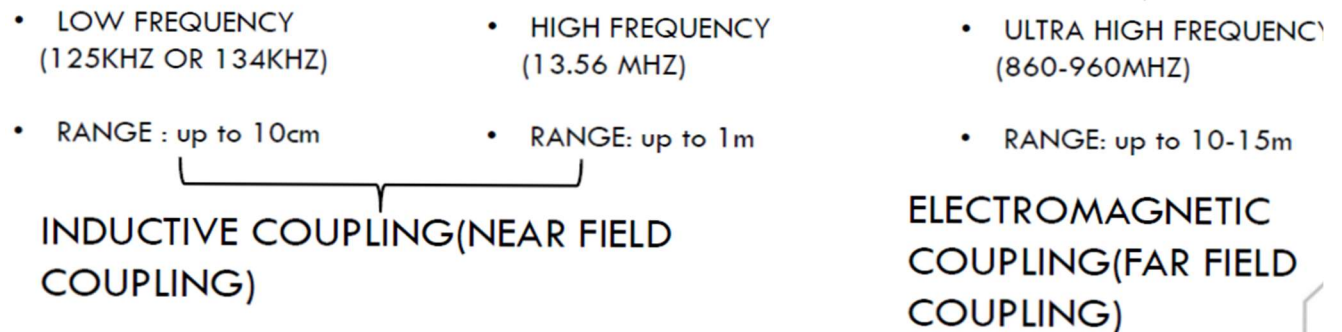- Active Tag Allows a read range of about 100 feet.

Passive tags:
- Passive Tags Doesn't contain a battery and get power from a reader.
- Reader send electromagnetic waves that produce a current in the tags antenna which then powers the microchip's circuits ($0.25-$3 per tag).
- Passive Tag Allows a read range of about 30 feet.

Reader Antenna and Station:
- An RFID reader is a device used to gather information from an RFID tag which is used to track individual objects.
- An RFID antenna takes energy from an RFID reader and transmit it in the form of RF waves to RFID tags in the vicinity.
- An RFID station consists of a host computer with appropriate application software.

FREQUENCY OF OPERATION

- **LOW FREQUENCY** (125KHZ OR 134KHZ)
  - RANGE : up to 10cm

- **HIGH FREQUENCY** (13.56 MHZ)
  - RANGE: up to 1m

- **ULTRA HIGH FREQUENCY** (860-960MHZ)
  - RANGE: up to 10-15m

INDUCTIVE COUPLING(NEAR FIELD COUPLING)

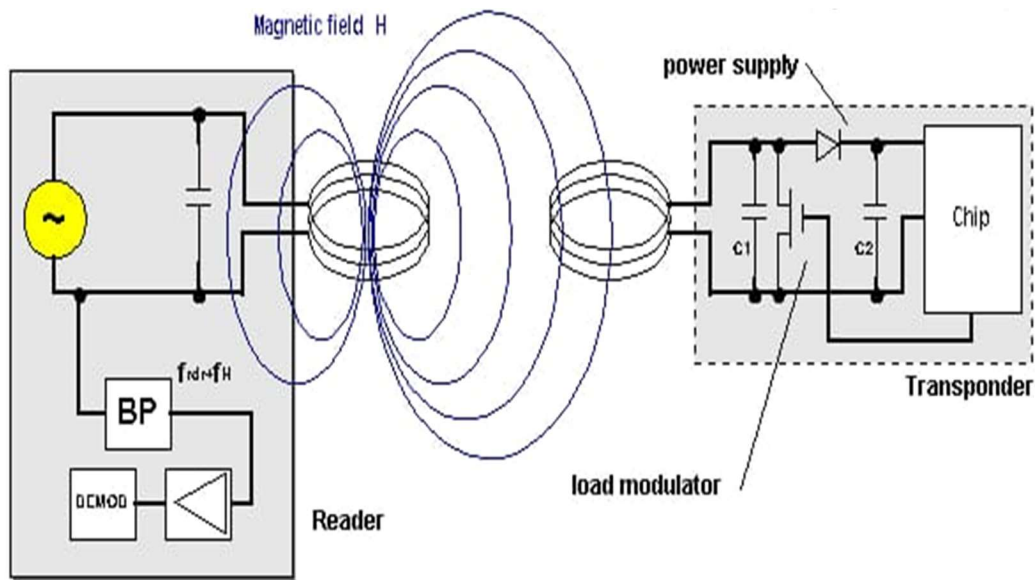ELECTROMAGNETIC COUPLING(FAR FIELD COUPLING)

What is Inductive coupling?

Transfer of energy for one circuit to another through a shared magnetic field powers microchip.

Circuitry uses load modulation to send data back to reader.

Inductive Coupling (Near Field Coupling)
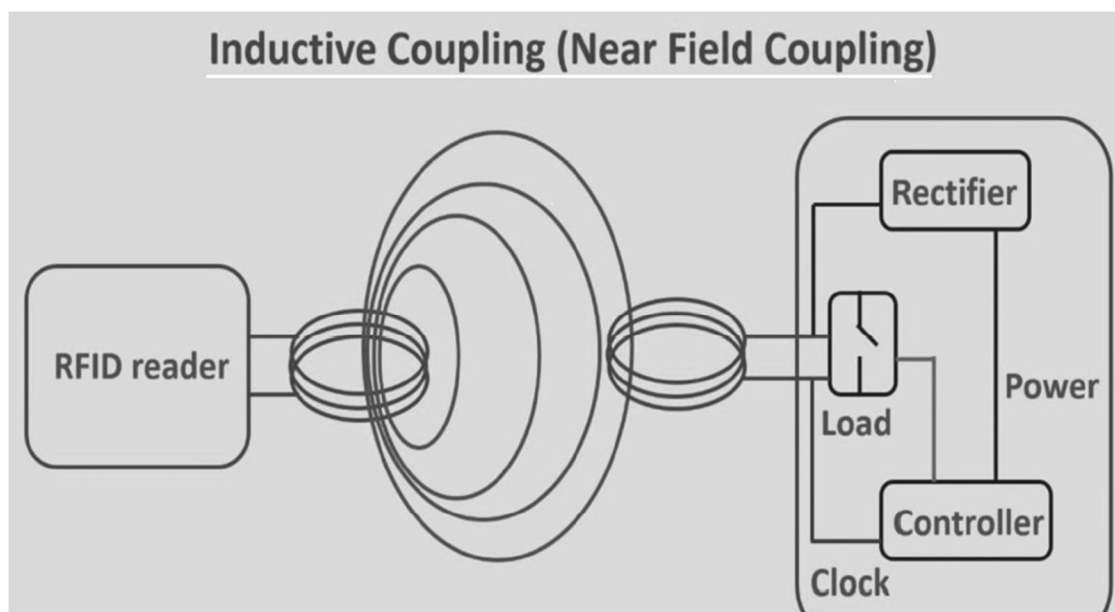
Operating principle

A RFID reader stays powered on all the time and is normally powered from an external power source. So when it is ON, the oscillator in it generates a signal with a desired frequency but as the signal strength will be very less (which may lead to fading off the signal if it is transmitted directly) it has to be amplified which can be done using an amplifier circuit, inorder to propogate the signal to a longer distance we need to modulate the signal which is done by a modulator. With all these improvements the signal is now ready to be transmitted which can be done by an antenna which converts the electrical signal into a electromagnetic signal.

The RFID reader signals are everywhere with it's promity to detect a tag. When a RFID tag comes in the proxmity of the RFID reader the tag detects the readers signal through a coil present in it which converts the received RF signal into a electrical signal. This converted signal alone is sufficient to power up the microchip present in the tag. Once the microchip gets powered up, its function is to send the data (unique ID) which it is stored in it. The same way the signal came in, it is sent out through the same coil into the air.

Advantages:

- RFID tags are very simple to install/inject inside the body of animals ,thus helping to keep a track on them.
- RFID technology can't be easily replicated and therefore it increases the security of the product.
- It doesn't requires line of sight communication.

Disadvantages:

- It is difficult for an RFID reader to read the information in case of RFID tags installed in liquids and metal products.
- Many countries have different range of frequencies that allow RFID tags to function.
- Signals can collide when multiple signals are read at once.

Applications

RFID can be used in a variety of applications, such as:

- Access management
- Tracking of goods
- Tracking of persons and animals[30]
- Toll collection and contactless payment
- Machine readable travel documents
- Smart dust (for massively distributed sensor networks)
- Locating lost airport baggage[31]
- Timing sporting events
- Tracking and billing processes
- Monitoring the physical state of perishable goods

Conclusion:

➢ RFID is a new form of technology that is being used to deliver the newest form of productivity and improvements.

➢ However the potential for abuse of this technology is vast and requires careful considerations to avoid.

➢ RFID is a Supporting technology not a competing Technology.

➢ **REGULATIONS AND EDUCATION ARE NECESSARY TO QUELL SOME OF THE FEARS OF RFID TECHNOLOGY...!!!**

REFERENCES AND BIBLOGRAPHY:

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