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Designing of Spectrum Tagging Device and Its Application in Autonomous Automobiles

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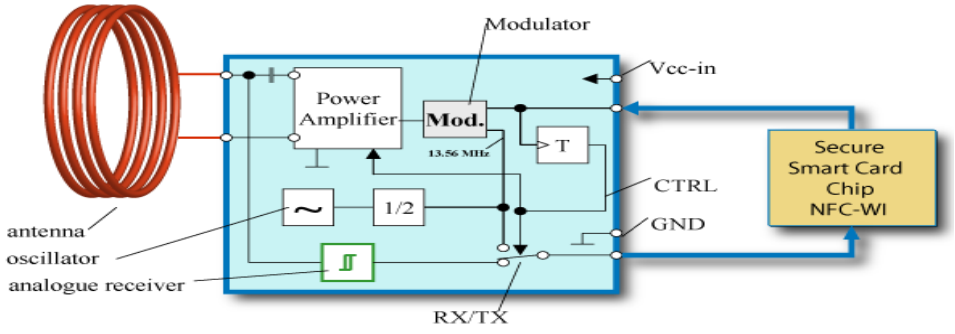
Abstract
With the invention broad spectrum range of electromagnetic wave, there is a leap in modern science and its application in daily life. Some of the applications are radio wave and micro wave communication with a broad range of spectrum associated with various inscription techniques for providing a diverse, uninterrupted and accurate communication application. This paper holds idea for developing Radio frequency operated tags for accurate positioning and a short range communication. This paper also comprises a potential application of these RF tags for autonomous automobile transportation with sharp accuracy.

Keywords: Radio tagging, Electronic Positioning, Short Range Communication, Autonomous Automobiles.

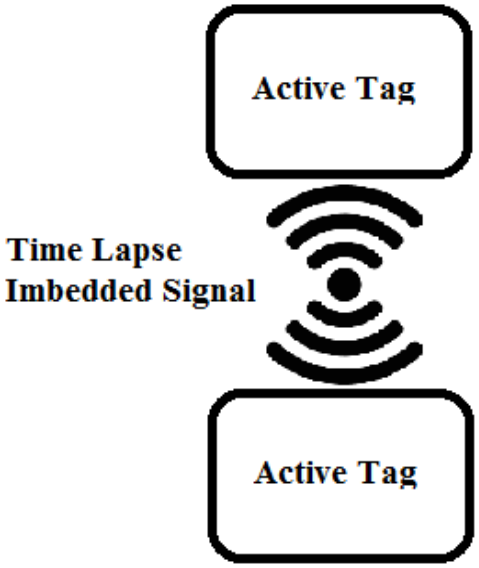
1. Introduction
Radio waves are essential for mobile communications. They are the means for transmitting information at the speed of light. With using active source RF Ids and a proper encryption of the signal, a unique electronic tag can be developed. These tags transmits signal in all direction with a highly calibrated time laps information and a unique id to let the detector identify the id nearby its vicinity. These tags can be used for potential highly accurate locating system to compete with low accurate and limited application GPS system. Use in vehicle automation can be designed using a series of these tags installed in each vehicle and designing fully autonomous systems using raw information from these Id network, working under a common database system.

2. Active RF Tagging Device
Active source RFid uses its own power source to generate its own unique signal and it contain its ow receiver and a processor for detecting these id signal near its vacinity in a short range.



To generate the modulation signal required to increase the reading range and to deal with the very weak reader signals received by the antenna due to a small antenna are (e.g. a contactless memory card inside a mobile phone), a special RF interface which is connected with the secure element, is required.
A simplified block diagram of the active RFID interface module is described above. The interface module consists of an amplifier, a modulator (M), an oscillator (OSC) with a frequency divider, and a signal conditioner. At the RF side, the interface module is connected with an antenna coil. On the digital side, the interface module has one signal output, SIGOUT, and one signal input, SIGIN, both of which are connected with the secure element. SIGIN and SIGOUT are used to link the smart card microcontroller with the active RFID interface module.

3. Signal Time Lapse Inscription



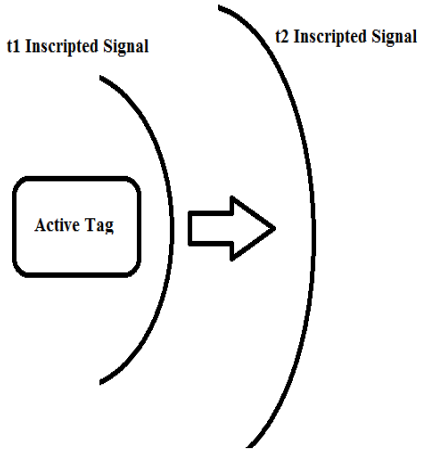
This technique is currently used in GPS signal inscription for providing a relative position of the receiver with respect to the source with accurately defined position of the source. This method provide an accurate but relative position interpretation method. This method involves the calibration of the source clock with the receive clock with a common reference calibration system. After the calibration process each and every signal is provided with a small spare band of signal to be used as template tag with containing the information of the time at which signal was generated by the source.

3.1 Signal Clock Calibration

The active RF-Id can be assigned with time zone wise calibration using GPS operated standard calibration system. As the standard clock used for this system is Cesium-Rubidium atomic clock, which is extremely accurate and reliable for fine accuracy calibration.

3.2 Time Lapse Signal Inscription

This method involves the process of assigning a spare band of the signal to a time tagging. This time tagging will contain the information of the time of generation of the signal. While receiving the signal by other device with same calibrated clock, the position of the signal source can be interpreted by the simple concept of Remote Sensing Distance Determination Method.



4. Multiple Tag Positioning Method

This method will allow multiple tags in a range to communicate with each other and bounce signals received from nearby tags to one another. This process goes by receiving the time lapse encrypted signal from a nearby active tag and processing its information to determine its relative position. Then this processed signal is again encrypted into the newly generated time lapse encrypted signal to be received by other nearby device. By this way a network of accurate positioning raw database can be created and can be analyzed in real time to create a live map of continuously moving tags in a broad range.

4.1 Raw Signal Analysis

Raw signal will be consisting of the live position of the tags with changing position with respect to one another. If position of any one tag is determined by any existing calibration like GPS or any communication tower then the network of moving tags can be analyzed and predicted for patterns.

4.2 Communication to a Master System

A master system is needed to control and manage the interface of many tags in nearby vicinity. For a proper controlled flow of position data of each tags the raw data of relative positions is analyzed by the master system. Any one tag connected to master system can provide the whole network a route to connect to the main analyzer and controller system.

5. Automation Application

These tags can be used to make a self-aware network of autonomous vehicle. The above description discussed the method to determine the accurate positions of the moving tags with a master system control link. If we try to apply this method to create a system of self position aware cars with well-defined positioned for other cars and their relative positions in real time. This system can be created by assigning each automobile with one of these Unique RF-tag to generate an active position signal with time laps encryption. With the same mechanism of interpreting and bouncing the signals in newly generated time lapse signal the network of vehicle can be analyzed with accurate positions and their relative changing positions. The Master system can be a smart computer with proper algorithms to avoid any collision between electronically controlled cars. The master system can optimize the pattern of the vehicle positions and their trajectories for a safe and driverless transportation.

6. Acknowledgment

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