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Measurement System with Accelerometer Integrated RFID Tag for Infrastructure Health Monitoring

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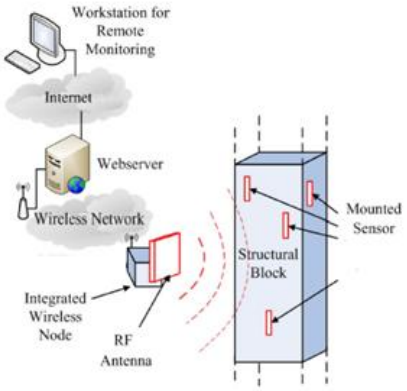
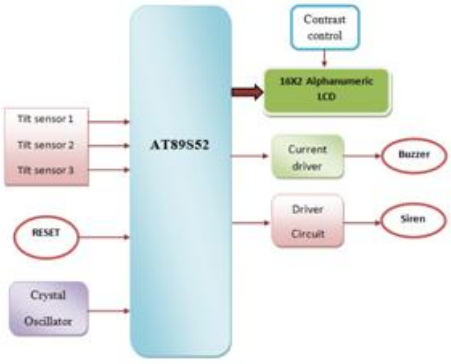
ABSTRACT:

Infrastructure health monitoring is an essential discipline in civil engineering as it provides vital information which can be used to evaluate the state of civil structures, such as bridges, buildings, and tunnels. For this purpose, measurements of dynamic responses of structures are highly important. Vibration-based infrastructure health monitoring is extensively used in this process to acquire the necessary vital information (e.g., natural frequencies and mode shapes) by measuring dynamic acceleration of structures.



Literature Survey:

Based on the vibrations caused by sensor the earth quake is known and siren/buzzer alert will be given.



Drawback:

No information is passed to the nearby station and no remote monitoring over IoT

Proposed System:

Here we are implementing an earth quake monitoring system. An earthquake (also known as a tremor or temblor) is the result of a sudden release of energy in the Earth's crust that creates seismic waves. Earthquakes are recorded with a seismometer, also known as a seismograph. This project presents Microcontroller based An Earthquake Detection using Sensing Element to reduce its destructive losses.Few sensors are mounted on building walls to identify the earth quake and its severity.

Tilt sensors and accelerometer are used to detect and these are fed as input to the controller and RF communication is used to intimate about this at the local monitoring station. A buzzer alert will be given if the vibrations are not severe, which is detected using accelerometer. The siren sounds high in case of much severe vibrations which are found using tilt sensors. At this monitoring station an IoT module is connected to make the information about this disaster using internet at remote location also.

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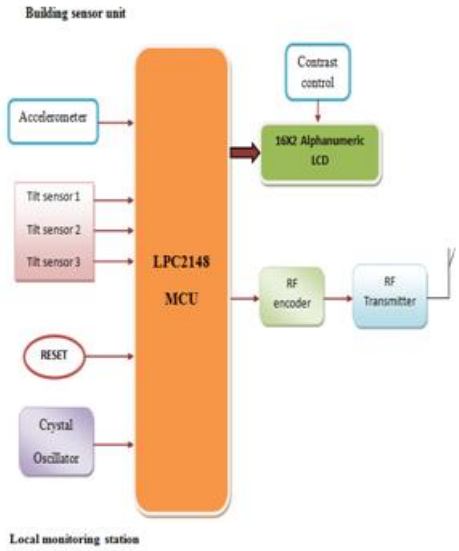
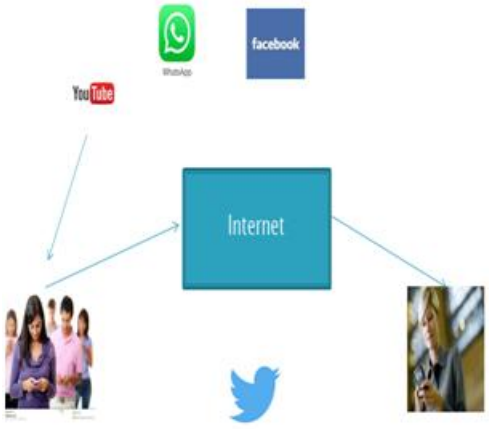
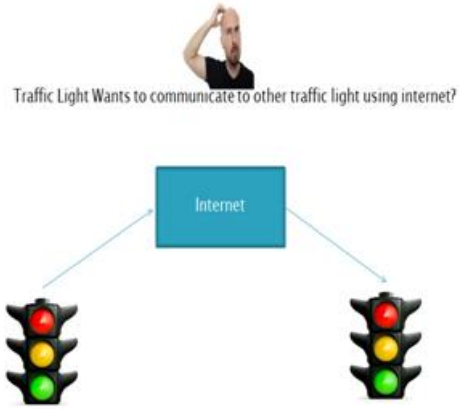


INTERNET OF THINGS

Internet is helping people to communicate each other using different applications





What if I want to communicate Things

Each other using Internet?

Internet of things helps the things to communicate each other using IoT module

ESP8266EX

- The Internet of Things (IoT) is the network of physical objects or "things" embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data.

Different Modules

- ESP8266(ESPRESSIF)
- ESP8089
- ESP6203

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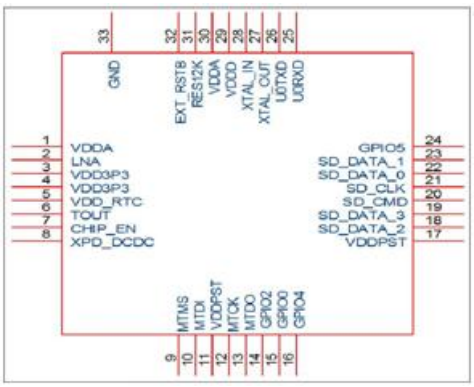
Wi-Fi Module

ESP8266EX offers a complete and self-contained WiFi networking solution; it can be used to host the application or to offload WiFi networking functions from another application processor. When ESP8266EX hosts the application, it boots up directly from an external flash. In has integrated cache to improve the performance of the system in such applications. Alternately, serving as a WiFi adapter, wireless internet access can be added to any micro controller-based design with simple connectivity (SPI/SDIO or I2C/UART interface). ESP8266EX is among the most integrated WiFi chip in the industry; it integrates the antenna switches, RF balun, power amplifier, low noise receive amplifier, filters, power management modules, it requires minimal external circuitry, and the entire solution, including front-end module, is designed to occupy minimal PCB area. ESP8266EX also integrates an enhanced version of Tensilica's L106 Diamond series 32-bit processor, with on-chip SRAM, besides the WiFi functionalities. ESP8266EX is often integrated with external sensors and other application specific devices through its GPIOs; sample codes for such applications are provided in the software development kit (SDK).

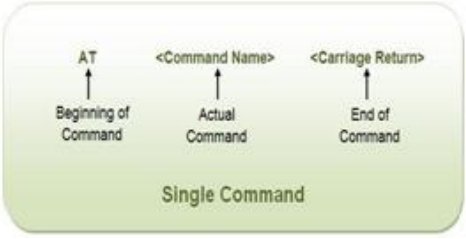
Features

- 802.11 b/g/n
- Integrated low power 32-bit MCU
- Integrated 10-bit ADC
- Integrated TCP/IP protocol stack
- Integrated TR switch, balun, LNA, power amplifier and matching network
- Integrated PLL, regulators, and power management units
- Supports antenna diversity
- WiFi 2.4 GHz, support WPA/WPA2
- Support STA/AP/STA+AP operation modes
- Support Smart Link Function for both Android and iOS devices
- SDIO 2.0, (H) SPI, UART, I2C, I2S, IR Remote Control, PWM, GPIO
- STBC, 1x1 MIMO, 2x1 MIMO
- A-MPDU & A-MSDU aggregation & 0.4s guard interval
- Deep sleep power <10uA, Power down leakage current < 5uA
- Wake up and transmit packets in < 2ms
- Standby power consumption of < 1.0mW (DTIM3)
- +20 dBm output power in 802.11b mode
- Operating temperature range -40C ~ 125C
- FCC, CE, TELEC, WiFi Alliance, and SRRC certified

Pin Definitions



AT commands are used to control MODEMs. AT is the abbreviation for Attention. These commands come from Hayes commands that were used by the Hayes smart modems



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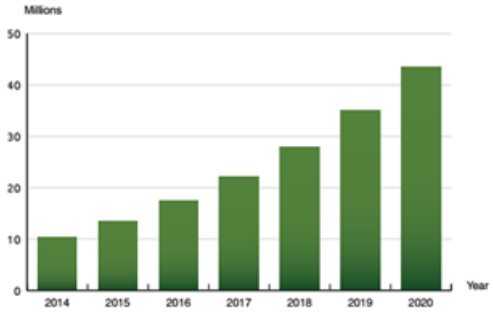
Important AT commands

- **AT+CWLAP** List all the access points
- **AT+CWJAP?+CWJAP="ssid", "password"** Join Access Point
- **AT+CIFSR** Get IP Address
- **AT+CWMODE?+CWMODE=3** Select the respective mode



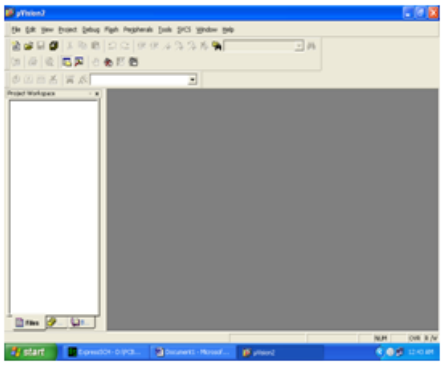
Installed base of active wireless devices in industrial automation (World 2014–2020)

Major fields of ESP8266EX applications to Internet-of-Things include:

- Home Appliances
- Home Automation
- Smart Plug and lights
- Mesh Network
- Industrial Wireless Control
- Baby Monitors
- IP Cameras
- Sensor Networks
- Wearable Electronics

Software Tools

Embedded C code is compiled in the Keiluvision tool



ADVANTAGES:

- Fit and Forget system
- Low cost and reliable circuit
- Accurate output.

APPLICATIONS:

- Apartments
- Offices, industries ,Shopping malls

CONCLUSION:

This project presents a infrastructure monitoring device. This project is designed and implemented with ARM7 in the stream of embedded systems. Experimental work has been carried out carefully. The proposed method is verified to be highly beneficial in all places.

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