

# development of IOT system-based on a network of sensors to detect fires in forests

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## Introduction

- Due to the increase of fires, which are taking place in forests, the need of systems that are able to detect fires at early stage, has become of great importance.
- Up till now, there is no solution for detecting fires and avoiding their spread without human's intervention.
- The applied methods are:
  - observation towers.
  - sanitation: includes removing dead/ dry and ill trees from the forests.
  - etc..

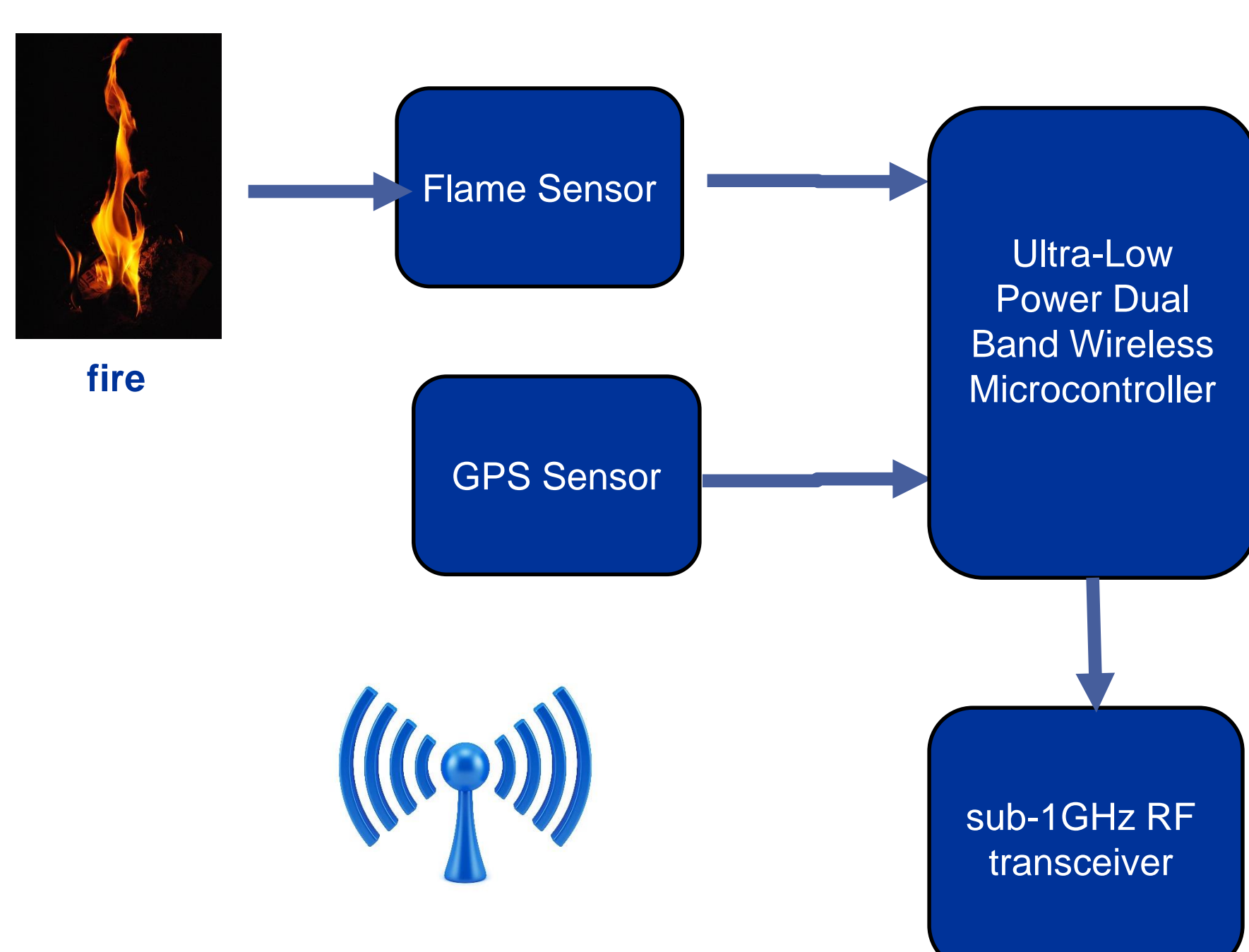
## Goals

To develop an inexpensive IOT system, which serves as an emergency alarms when a fire starts progressing in a wide open area. The system is built with a net of sensitive units, each unit transmits its location when a fire is detected. The unit should be ultra low power consumption, so it will be able to have at least 10 years lifetime.

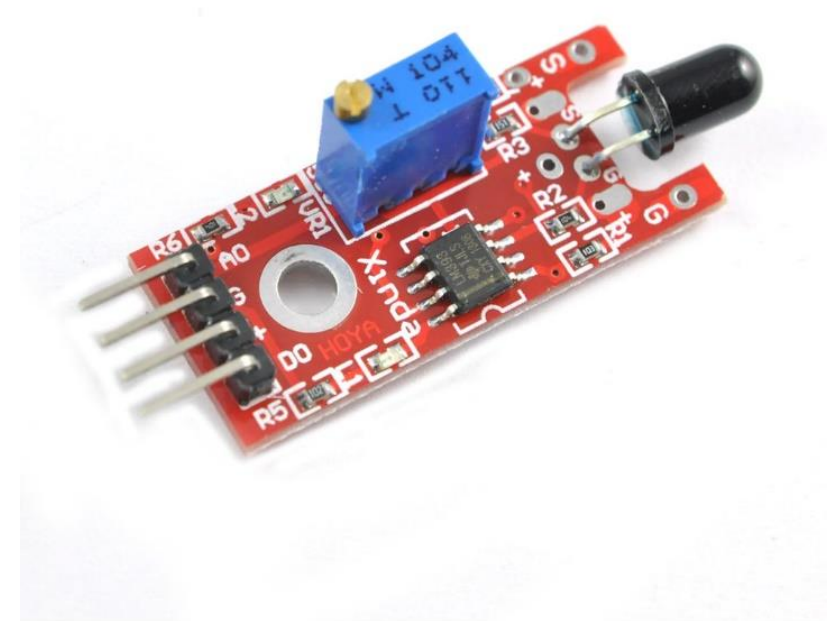
## Challenges

- Low-cost price.
- Low-cost maintenance.
- Long life battery (10-15 years).
- Resists environmental factors.
- The possibility of replacing damaged units.
- Enables further extension.
- There is no previous implementation that provides usage templates.

## Unit Architecture



## Detector Smart sense For Temperature Detecting Flame Sensor Module IR Sensor



- High sensitivity IR receiver
- Extremely sensitive to wave between 760-1100nm
- AO, real-time thermistor voltage signal output
- DO, high / low electric level signal output
- Analog quantity output
- Threshold rollover electric level output
- Threshold adjusted by potentiometer
- Detection Angle Range: About 60 degrees
- Power Supply: 0-15 V DC

## Simplelink™ Sub-1 GHz and Bluetooth® low energy CC1350 wireless MCU LaunchPad™ Development Kit



- The CC1350 wireless MCU contains a 32-bit ARM® Cortex®-M3 processor that runs at 48 MHz as the main processor.
- LaunchPad kit with a Sub-1 GHz and Bluetooth low energy radio for wireless applications with integrated PCB trace antenna
- We use The SimpleLink Sub-1 GHz CC13x0 software development kit (SDK) which provides a comprehensive Sub-1 GHz software package for the [CC1350](#) wireless MCU .SDK includes the TI 15.4-Stack software, providing an IEEE 802.15.4e/g-based star topology networking solution for Sub-1 GHz band

## CC4000 GPS Module Kit



- Protocol Communication - NMEA
- Performance - Autonomous cold start TTFF of 35 seconds in open sky signal conditions
- Autonomous hot start TTFF of ~1 second in open sky signal conditions
- Tracking Accuracy better than 3 meters
- GPS tracking sensitivity -- -162 dBm
- Embedded software - Fully integrated GPS driver
- Push-to-fix - Single GPIO activates power management for active and deep sleep
- Ephemeris data - Automatically maintains satellite positioning information, valid for up to 4 hours
- Pulse-per-second (PPS) generator - Independent output for high precision timing applications with accuracy <100ns (nominal)
- Host interface - UART

## ZigBee Protocol

- Zigbee is a standards-based wireless technology developed to enable low-cost, low-power wireless IOT networks.
- A key piece of the Zigbee protocol is its ability to support mesh networking. Zigbee uses a mesh network architecture for communication.

