Topic :

child saver

Setting an alarm for uncovered borewells using proximity sensor

The explanation of the papers that we have viewed is given below we have searched in ieee xplore we couldn't get as much content related to my topic as we was able to collect hardly 3 to 4 where that does not related that much so i have outsourced at google for our topic where we have get some information about proximity sensors

Proximity Sensors:

To create applications for smart environments we can select from a huge variety of sensors that measure environmental parameters or detect activities of different actors within the premises. Capacitive proximity sensors use weak electric fields to recognize conductive objects, such as the human body. They can be unobtrusively applied or even provide information when hidden from view. In the past years various research groups have used this sensor category to create singular applications in this domain. On the following pages we discuss the application of capacitive proximity sensors in smart environments, establishing a classification in comparison to other sensor technologies.

This would be useful to us to detect human and make sound to alert them to prevent and avoid from falling inside a uncovered borewell and pothole The proximity sensor is used here to detect the humans in the surrounding if they are at 1 foot and detect and trigger them with an alarm to be alert this is the role of proximity sensor in our project and other than this the information that we have collected about proximity sensors are:

A proximity sensor is an organ of an device or for machines there are totally six types of proximity sensors

Inductive Proximity Sensor

Capacitive Proximity Sensor

Ultrasonic Proximity Sensor
Infrared (IR) Proximity Sensor
Photoelectric Proximity Sensor
Hall Effect Proximity Sensor

For our project:
Infrared (IR) Proximity Sensor
Ultrasonic Proximity Sensor
Combination of this sensor is best for human detection around borewell as both the sensor used to detect body heats to detect humans so this would be useful to detect humans and alert them

Why are we using proximity sensors for detection?
Non-contact detection: No physical touch needed.
Fast response time: Quickly detects nearby objects.
Durable: Works well in harsh environments.
Long lifespan: Less wear and tear since no moving parts are involved.
An Infrared (IR) Proximity Sensor detects objects using infrared light without physical contact. It works by emitting IR rays and analyzing the reflection to determine the presence and distance of an object. This is how infrared proximity sensor is working
An Ultrasonic Proximity Sensor detects objects by sending out high-frequency sound waves and measuring the time it takes for the sound to bounce back. It works similarly to how bats and sonar systems detect objects.this is about how ultrasonic sensor is working

The working mechanism of these sensors is that the proximity sensor continuously scans the designated area around the uncovered borewell or drainage pit.

If motion or a human presence is detected within a 1-foot radius, the sensor signals the microcontroller.The microcontroller activates the alarm system, producing a loud siren to alert nearby individuals.An optional wireless module SMS-based system can notify local authorities for emergency

response.The system operates on a low-power consumption model, ensuring long-term deployment with minimal maintenance.

The sensor and alarm system are installed around open borewells and drainage pits.Sensors are configured to detect movement exclusively within the target range, minimizing false alarms.The system undergoes real-world trials to ensure efficiency in various environmental conditions.Local authorities and residents are informed about the system for effective response in case of alerts.

This are also will be helpful in smart city integration project in future

Uncovered borewells and open drainage pits have become a serious safety hazard, especially in developing countries. These open holes are often left unmonitored in rural and semi-urban areas, leading to tragic accidents involving children. Despite advancements in infrastructure, the recurrence of such incidents highlights the need for immediate safety measures.

Several tragic incidents in India have highlighted the severity of this issue:

Tamil Nadu (2019): A 2-year-old child fell into an abandoned borewell in Trichy, leading to a prolonged and unsuccessful rescue operation.

Madhya Pradesh (2022): A 5-year-old boy fell into a 60-foot borewell, sparking national concern.

Gujarat (2023): A toddler fell into an open drainage pit and lost their life before rescue teams arrived.

These incidents reveal the urgent need for preventive solutions rather than relying solely on rescue operations.

These are the reasons which we need this kind of inventions

Paper 1:
https://iopscience.iop.org/article/10.1088/1742-6596/1767/1/012028/pdf

Drones equipped with ultrasonic sensors address the problem of uncovered borewells posing a serious threat, especially to children. The

proposed system incorporates four major modules which include activation of the drone camera, identification of the borewell, depth measurement with the use of an ultrasonic sensor, and cloud updation. The drone moves along a fixed path in an open area and applies image processing for borewell detection and ultrasonic sensors for depth measurement. The measured distance is classified into different zones viz. Green, Yellow, and Red depending upon the severity of the depth from the top of the hole. If the distance is more than 3 feet, the hole is classified as a Red Zone and an alert signal is sent to the control room for action. The details of location and depth of the borewell will be stored to the cloud for future reference. In addition to that, the system contains GPS and GSM module to communicate location to authorities. This IoT solution provides a solution for detecting and measuring hazardous potholes that could help enhance safety by alerting concerned authorities to avert the accidents. Some other future work could include addition of Passive Infrared Sensors for further detection and alerting people on close proximity.

Paper 2: https://ijcrt.org/papers/IJCRT2401736.pdf

The Smart Borewell Child Rescue System provides a novel solution that is aimed to address the pertinent matter of safety involving borewells, and flies explain incidents in which children find themselves accidentally dropped into these deep structures of water extraction. It comes with enough versatility and selection in addition to its basic function; borewells are some of those spaces with midway openings for water collection and pose serious risks due to the generally fetched openings. The existing measures of security are totally considered inadequate; therefore, either there is a physical check or the approach is reactive in nature and takes time to respond when any emergencies occur. This paper introduces a rather pro-active system that brings in wireless monitoring technologies, and artificial intelligence (AI) brought on to offer better safety around a borewell and improvement upon rescue operations.

The system incorporates a series of detectors that are strategically deployed around borewell areas, and include proximity detectors and environment sensors. These detectors communicate wirelessly with a central control unit featuring microcontrollers and AI. Using wireless communication protocols such as LoRa or Zigbee, it allows for real-time monitoring and transmission of data to a centralized location. AI algorithms analyze the sensor data and notify the observatory operation if an anomaly, such as a child falling into the borewell, occurs. The system minimizes the ringing for false alarms and expeditiously continues to respond to emergencies.

In the event of a calamity, the system helps provide the positioning of the child in the borewell; therefore, rescue teams will easily devise and effect operations. This will reduce very high response times and greatly increase the probability of successes. Moreover, the system consists of some superior hardware-comprising an ESP32 camera, microcontroller, and a robotic arm mechanism-to assist in the rescue operations.

The existing systems of borewell safety are manual and are thus remote ones; this very aspect has led to delayed responses. The system proposed thus fills these gaps by incorporating high-end technologies, thereby, offering a proactive and intelligent solution. It could save lives and improve the standards of safety around borewells.

Paper 3: https://www.jetir.org/papers/JETIR2405G14.pdf

The Smart Borewell Child Rescue System aims to research advanced rescue solutions to diminish hazards posed by borewells, particularly children's accidental entry into them. Reactive manual inspections, becoming entrenched in traditional systems, have resulted in deplorable delays. Integration of wireless monitoring, robotics, and AI offers a new spectrum of safety measures and improved rescue missions.

Different kinds of sensors, including proximity detectors and environmental ones, are distributed around the borewell perimeter at various angles. These sensors wirelessly communicate to a central control unit coupled

with a microcontroller running AI algorithms. Reliable protocols such as LoRa or Zigbee allow monitoring without wires, transferring data at intervals to a central control station. The algorithm uses the sensor data to discover anomalies-perhaps a fall with a subsequent borewell-warning approaches this assistance, thus generating far fewer false alarms and ensuring speedy response.

The system ensures that the child's location is instantly available during emergencies, thus enabling speedy and efficient rescue operations. Highly advanced hardware components including an ESP32 camera, an embedded microcontroller, and a robotic arm mechanism were utilized for the rescue. The robotic arm is mobile app-controlled and securely detains a child in distress.

In hazard detection helping the incident on-site to reduce the response time, real-time monitoring offers a promising advancement to wireless technology. Future works shall test running AI-based algorithms, implement edge computing, and ultimately an autonomous rescue action. This device-enabled solution has impacted the borewell safety mechanism that would enable the safeguarding of children from those unlucky accidents.

Paper 4:
https://www.researchgate.net/publication/349451482_IoT_based_detection_of_bore-well_unclosed_holes_using_automated_drone_operated_cameras_in_a_remote_area\

India is a developing country that has faced severe water scarcity leading to the increased drilling of borewells. Unfortunately, many borewells remain uncovered, posing a serious hazard to children since they can fall into them easily. As a solution to this menace, drone cameras with ultrasonic sensors are proposed for locating and measuring borewells in remote areas. The intent is to safeguard from accidents. Particularly, it includes detecting potholes and alerting the concerned authorities.

Drones using image processing techniques will survey, spot, and identify borewells within the defined area, with an ultrasonic sensor mounted on the drone measuring and mapping depth and width of the borewell. If the borewell is over 3 feet deep, the authority to which it belongs will mark it "Red Zone"-highly Dangerous. All available relevant data acquired by the drone-like GPS coordinates of the borewell, the dimensioning of the pothole, etc-will be transmitted in real-time to the cloud server for further monitoring and analysis. The authority would be informed to close the borewell to preempt accidents.

These unique solutions allow minimal human involvement in processes and endorse technology-based life-savers. Integration of drone technology and ultrasonic sensors with cloud storage makes the system more powerful in the detection and monitoring of dangerous, uncovered borewells. It is thus a new solution to a serious safety concern for children and communities from the tragedy of uncovered borewells. This technology-driven effort offers hope for an improvement in safety standards in urban and rural settings alike across innumerable facets of life.

Paper 5:
https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=10798477

The transportation industry is becoming increasingly sophisticated through the merging of technology, combining what in the past were called human-driven vehicles to autonomous and teleoperated vehicles. Further on, challenges of road safety and infrastructure maintenance come in, which are responsive challenges in developing countries. Potholes are cornerstone hazards involving accidents, traffic jam, and vehicle breakage each year digging deep into billions of dollars in economic losses. The fast-evolving smart transportation systems employ the IoV to cure the ails of road safety and traffic efficiency using an arsenal of technologies like AI, ML, and DEI.

Pothole detection has been proposed to utilize the combination of DEI, digital twins, and computer vision. Advanced algorithms like YOLOv9t, which boast of high accuracy and low latency, find potholes in vehicles with dashcams and sensors and send alerts on detected potholes to vehicles and Roadside Units through vehicle-to-vehicle and vehicle-to-infrastructure communication. The digital twin builds and keeps a virtual representation of the road and updates it with the pothole data to support timely repairs by the authorities.

Simply put, this solution provides drivers with real-time alerts regarding potential hazards, thus reducing the chances of accidents and impeding the buildup of traffic. It embodies the trifecta of an edge computing-based CAV, AI, and Cooperative Perception with a robust solution to the realization of safer and efficient transportation networks.

Paper 6:
https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=10737029

Road accidents are a worldwide problem that kills 1.19 million people a year-92% of which are in low to middle-income countries including Bangladesh. Bad roads, reckless driving, and poor emergency response are main contributors to the high rate of accidents. To address this "safety," the sensing device "RoadSense," has been developed, using sensor technology and machine learning that will identify road conditions and then notify drivers real time in case of accidents.

The device will use sensors like accelerometers, gyroscope, and GPS that will collect real-time data about potholes, speed breakers, and hard braking events. It will use tree-based machine learning models, including Random Forest and Extra Trees, to predict road conditions with a very high accuracy of up to 99.07%. In addition, the cloud-based corrections of the GPS data will be used in the system to have accurate location information.

RoadSense alerts the driver on real-time hazards so that he can avoid them, while the authorities can use the collected data to make timely road

repairs. The device is very affordable, scalable, low-cost, and adaptable to the needs of the resource-constrained urban environment in developing countries. Future plans include spreading its use all over Bangladesh integrated into an advanced driver-assistance system to improve safety. By doing this, RoadSense can possibly save lives and mitigate economic losses.

Paper 7:
https://www.ijraset.com/research-paper/smart-borewell-vehicle-monitoring-system-a-microcontroller-based-gsm-informer

The Smart Borewell Vehicle Monitoring System uses Arduino MEGA 2560 microcontroller for automation and operation enhancement of borewells. The system employs proximity sensors, a GPS system for location tracking, and a GSM module for SMS notifications to the owner of the vehicle and a customer, when the compressor starts. An SMS will contain the location and time the compressor started. When completed, another SMS will state the number of rods drilled and how long the compressor was running. Data is also stored in an SD card for borderline analysis.

The system is meant to ensure the manual monitoring inefficiencies of a delay and human error are put to rest by ensuring real-time updates are carried out, delivering accurate and timely data. The system improves transparency and customer satisfaction, as communications to the customers are timely and guarantee proper monitoring progress. The input from the ATmega328 microcontroller comes from the sensors. The data management/controlling of the system is done through the ATmega328, while an LCD displays real-time visual feedback.

The system provides key benefits like the following:

Automating the entire process reduces human interventions and human errors.

Provides instant SMS alerts on the compressor's status and drilling progress.

GPS helps in geolocation of the vehicle and thus makes accurate updates.

The SD card can record previous data for analysis and retrospective performance evaluations.

This supposedly sophisticated setup of systems is noted to boost the standards of borewell operations by providing efficient monitoring, reduced costs, and greater satisfaction of both customers and borewell owners. It is thus ideal for industries that heavily depend on borewells, such as irrigation and water supply, throwing a scalable version of cost-effective borewell.

Paper 8:
https://iopscience.iop.org/article/10.1088/1755-1315/426/1/012039/pdf

This research concentrates on implementing a reasonably economical and efficient pothole detection system for motorcycles in Indonesia, where high rates of accidents are caused by the prevalent condition of roads. The detection of potholes is made using infrared light-prompted proximity sensors, gyroscopic sensors for orientations of the vehicles, and Hall Effect sensors for speed measurement. The sensors are incorporated into an Arduino-based microcontroller (NodeMCU) that will process the data and provide the rider with any alerts or warnings in real-time using an OLED display, LED lights, and a buzzer.

The system generally gets activated when the vehicle speed exceeds 5 km/h and when the orientation does not vary. If a pothole is detected, visual and auditory alerts are generated to warn the rider. The proximity sensor's range of detection is 7 m with an average error of 1.58% on practical grounds. Testing with the system showed working distance for pothole detection was within the range of 2.5-2.7 m with a very small rate of error of around 0.73%.

This cost-effective solution comes as a huge benefit to motorcycle users in the developing world, offering an economically viable alternative to costly camera-based systems. With heightened awareness of poor road conditions, the system is anticipated to enable fewer accidents and enhanced rider safety. Future enhancements may bring refinements in sensor sensitivity and a wider repertoire of pathologies addressed.

Paper 10: https://www.irjet.net/archives/V7/i9/IRJET-V7I9475.pdf

The Borewell Rescue System is aimed at rescuing children who may fall into abandoned borewells, which render a problem where lives can often be lost. The system is portable and efficient with various techniques of rescue and life support systems, functioning at the same time to ensure a child's safety during the rescue operation.

The system comprises a manipulating arm sensory devices like camera, proximity sensor, and oxygen sensor, and controllers operating between desktop PC or mobile devices. The manipulator stretches and positions itself under the child using rack and pinion mechanism while being stabilized with a scissor mechanism . A balloon cushion inflated underneath the child protects him/her from further injury. The system is stabilized inside the borewell with the help of a four-jaw chuck mechanism .

Undermentioned are the salient features:

- Real-time monitoring -A Wi-Fi camera and LED light feedback will effectively inform the rescuers of the child's position and condition.

- Oxygen supply -An oxygen tube will grant the child time to breathe till rescuers arrive.

- Safety mechanisms -The protective casings and balloon cushions in the system keep him/her from sustaining additional injuries.

Rostered to be very lightweight, with a composite material like carbon fibre that strengthens it further and entitles durability, it is adjustable for various borewell diameters and depths. It's a remote-controlled unit that promises a swift and safe salvaging operation. Testing has indicated its satisfaction with the competent prototypical design; thus, it gives hope for saving trapped children.

Paper 11:
https://www.irjmets.com/uploadedfiles/paper//issue_6_june_2022/27385/final/fin_irjmets1657016840.pdf

The Smart Child Rescue System for Open Borewells is meant, first and foremost, to save children who, due to unplanned circumstances, fall into an open borewell abandoned or neglected, thereby posing a great risk of fall into it. The traditional means of rescue are time-consuming and dangerous as they require heavy earth-moving machines for digging parallel pits. Hence, it is now proposed that an Automatic Mechanical System be designed to save children trapped in open borewells as efficiently and quickly as possible.

The objections are met by the system itself being equipped with IR Sensors placed within the borewell for detecting falls of a child. Once the coding detects that a child has fallen into the borewell, the lid mechanism starts its functioning to stop the fall. The system is driven, monitored, and controlled by an Arduino microcontroller and alerts via SMS to the relevant authority about the status of the place by the GSM module within no time.

The components include:

IR Sensors : Detection of child's fall with the aid of detecting any obstacle.

LM567 IC : Tone decoder for processing analog signals.

DC Motor : Works the sliding lid mechanism.

Relay : Controls motor, along with other high-power components.

GSM Module : Provides alerts to rescue teams in real-time.

The system has been developed for the sake of simplicity and efficiency, with cost-effectiveness that would ensure fast action to avoid risks to child safety as well as rescuers. Through automation of rescue missions, the project aims at saving lives lost due to open borewells.

Paper 12: https://ijbmi.org/papers/Vol%2813%296/13066972.pdf

The developed Comprehensive Borewell Control and Sprinkler Management System uses the Mobile IoT technologies to facilitate the management of water for agriculture. The borewell parameters like water levels, quality, and pumping performance will be monitored through sensors and actuators with very minimal human interventions. This could then be controlled manually or by means of IoT-based technology through Android and other apps. Real-time computations like soil moisture and weather prediction allow an IoT-enabled sprinkler to bring automation to the irrigation space while ensuring efficient use of water and preventing over-pumping.

Some noteworthy features:

- Real-Time Monitoring : Sensors can detect water levels, temperature, and soil moisture.

- Remote : Farmers can manage pumps and sprinklers via a mobile app.

- Fault Detection : Issues on mechanical failure or faults in the system can be flagged maintenance.

- Data-Driven Decisions-Making : Real-time analytics can optimize irrigation schedules.

It will reduce hand-on-the job, save water, and ensure more crop production. Economical, expandable, and means one can access the field even if not the reachable ones, thus providing a sustainable kit for modern agriculture. The combination of IoT technology with a rather simple user interface provides for the correct management of water resources by the farmer and increases output further.

Paper 13:
https://irjiet.com/common_src/article_file/1716017872_c46b3f05d7_8_irjiet.pdf

Designed for purposes of rescue, the Child Rescue System from Borewell is meant to save children accidentally falling into disused borewells, a persistent and life-threatening matter. The traditional methods of rescue, parallel trench digging, are arduous, slow, hazardous, and require heavy machinery. This project puts forward a portable, cost-effective, and efficient system to save trapped children quickly and safely.

The system uses sensors like PIR, temperature, and gas to develop sensors inside the borewell to assess the internal conditions of the borewell and allow detection of children. A gripper mechanism powered by a dc motor will hold the child up and safely retrieve him/her. Moreover, a camera and LED lights will give a visual of the child's location; meanwhile, cloud storage and analysis down via an IoT module will be storing and analyzing data for the use on the customer's end. The immediate action shall be signaled through GSM notifications.

Looking forth, its features include:

- Real-time monitoring-Sensors and cameras grant live updates on boys in a child.

- Automated rescue-gripping mechanism safely carries the child with no manual intervention.

- Environmental monitoring-temperature and gas sensors ensure no harm is done to the child.

- Cloud integration-Data is stored for future reference and analyzed.

This system is attractive due to its lightweight experience, affordability, and ease of operation, to suit mass and consistent adoption. This will also cause a sharp decline in rescue operation ambiance as the system incorporates the removal of heavy machinery in the rescue operation, hence bringing more safety and efficiency. The project serves to use embedded systems and IoT in a bid to race against time, life saved, and probably avert tragedies unfolding out of an open borewell.