**Ideation Phase**

**Defining the Problem Statements**

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| **Project Name** | **SMART WATER MANAGEMENT** |
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**SMART WATER MANAGEMENT**

**Problem Definition and Design Thinking**

**Introduction:**

Water supply is the most important thing in daily home activity. We commonly supply the water by pumping the groundwater to fill a water tank. However, the utilization of non-automated switch used to turn on and turn off a pumping machine sometimes causes either the water spills or a wasteful electrical consumption. In this work, an automated water tank filling system will be proposed. By applying an ultrasonic sensor, an ultrasonic transmitter is mounted on the top of the tank and transmits an ultrasonic pulse down into the tank. The transmitter is programmed to automatically determine the liquid level and switch the pumping machine. The dynamics of water flow and liquid level during filling and draining the water tank will be reported. We hope to this system, people will enjoy supplying water without their worries related to water spills and a wasteful electrical consumption.

**Problem Statement:**

Overflowing water tanks contribute to the majority of wastage of water in residences. Most of the time, it is due to human error that tanks are allowed to overflow. So, by automating the process and by removing the human error from the picture, we can reduce the wastage of water by quite a bit. Another reason for wastage of water is due to leaks that occur in pipes. These leaks might not be detected immediately, and by the time the leak is detected, a lot of water will already be wasted. Sometimes the leak might not be detected until after a long time-wasting a lot of water in the process. By placing sensors in the pipes, we can detect the flow of the water in pipes and immediately detect any leaks in the pipe and immediately notify the user. By using electrically controlled valves, we can cut off the water supply to minimize the wastage of water. The utilization of water can be minimized by reducing the flow of water from the tank itself.

**Key Challenges:**

**Power Efficiency:** Many IoT devices are battery-powered, and maximizing their battery life is essential. Efficient power management and low-power communication protocols are necessary**.**

**Environmental Impact:** The production and disposal of IoT devices can have environmental impacts. Reducing the carbon footprint of smart water management systems is a growing concern**.**

**Human Behaviour and Acceptance:** Convincing users and stakeholders to adopt smart water management practices can be challenging. People may resist changes in their water usage habits or about IoT technology.

**Predictive Maintenance:** Ensuring the continuous operation of IoT devices and addressing maintenance issues proactively is essential. Predictive maintenance techniques are needed to prevent device failures.

**Communication Infrastructure:** Reliable communication networks are essential for transmitting data from remote IoT devices. Coverage, bandwidth, and latency issues can affect data transmission.

**Design Thinking Approach**

**Empathize:**

Before diving into solving the problem, it's crucial to empathize with the users and understand their needs. In this case, our primary use to control the overflow of water from the water tanks. So, by automating the process and by removing the human error from the picture, we can reduce the wastage of water by quite a bit.

**Actions:**

- Conduct surveys or interviews with potential users to gather their perspectives.

- IoT sensors are placed at various points in the water supply and distribution system.

- IoT sensors can detect leaks in pipes by monitoring pressure drops or unexpected flow changes. This enables quick identification and repair of leaks, reducing water wastage.

**Define:**

Based on our understanding of the problem and the users' needs, we will define clear objectives and success criteria for our project.

**Objectives:**

* It helps to control the valve by turning water flow on or off as required. The automatic water level controller minimizes the need for manual switching and human interference. The machine helps to detect level of water or any liquid.
* In our project, the water level monitoring and controller can be very helpful in minimizing the use of man power and decrease the waste of water. For this ultrasonic sensor is used. If used on a large scale, it can provide a major contribution in the conservation of water for us and the future generations. we can also use this in water level indicator circuits in factories, chemical plants, and electrical substations and in other liquid storage systems.
* Automatic tank filling in-home helps to automate our motor and fill the tank whenever it reaches the threshold level and turns off the motor after the tank is full.

**Ideate:**

Brainstorm potential solutions and approaches to address the problem. This phase involves thinking creatively and considering various algorithms and techniques for smart water management.

**Actions:**

- They can adjust water flow, pressure, and temperature based on real-time data and demand.

- IoT devices use wireless communication protocols like Wi-Fi or cellular networks to transmit data to a central hub.

**Prototype:**

Create a prototype of IoT model and the user interface for control the overflow of water.

**Actions:**

- Ultrasonic or float-based sensors are placed inside the water tank to measure the water level accurately.

- These sensors can detect when the tank is full or nearing empty.

- A microcontroller or an IoT device is connected to the water level sensors.

**Test:**

Evaluate the model's performance using appropriate metrics and gather feedback from users.

**Actions:**

- If the tank is full, the system will close the valve to prevent overflow.

- If the water level is low, it can open the valve to refill the tank.

- To conserve energy, the system can be designed to operate during off-peak hours or use energy-efficient pumps and valves.

**Implement:**

Once the prototype meets the defined objectives and receives positive feedback, proceed with full implementation.

**Actions:**

- Connect a suitable power source to the microcontroller, ensuring it can provide stable and continuous power.

- Identify the target location for installation.

- Determine the optimal placement of the ultrasonic distance sensor inside the water tank for accurate water level measurements.

**Iterate:**

Continuous improvement is essential. Gather user feedback and iterate on the model and interface to enhance accuracy and usability.

**Actions:**

- Integrate automation systems to control water pumps, valves, and irrigation based on real-time demand.

- Implement remote control capabilities for adjustments.

- Implement automated water treatment systems to maintain water quality.

**Conclusion:**

In this document we have achieved the main objectives. Moreover, this project involved designing and development of automatic water level control system had exposed to the better way of software and hardware architecture that blends together for the interfacing purposes. The system employs the use of advance sensing technology to detect the water level.

* This system is very beneficial in rural as well as urban areas.
* It helps in the efficient utilization of available water sources.
* If used on a large scale, it can provide a major contribution in the conservation of water for us and the future generations.