Wall Scanner

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Idea: Water Pipelines and Electric Wires in Wall Detection
AKA: Stud Finder, Wall Scanner
Issue: Expensive, Unreliable
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Detecting AC Electric Wires (Electro magnetic waves)

- For Live Wires [simple, reliable]
    - Passive detection (sense EM wave around wires)
- For Non-Live Wires [complex]
    - Active detection (send signal, wait for response)

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Requirements:
1. Inductive coil
2. Ferrite Core (soft iron core)
3. Amplifier
4. Microcontroller
5. Software
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Detecting Water Pipelines (High frequency Radio Frequency)

- Ground-penetrating Radar [complex, efficient]
    - GPR works by transmitting a high-frequency radio signal into the wall and measuring the time it takes for reflections to return.
- Capacitive Sensing Array [simple, practical]
  - A capacitive sensor creates an electric field. When you place it against a wall, the wall and the object inside (a pipe, a stud) become part of this field. Different materials have different dielectric constants, which changes the capacitance of the sensor. By measuring these changes, you can infer the presence of an object.

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Requirements:
1. Capacitive Sensor (a metal plate or a custom-designed PCB pattern)
2. Capacitance-to-Digital Converter IC (A dedicated chip like a Texas
Instruments FDC1004 or similar)
3. Microcontroller
4. Software
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Final

- **Passive Electromagnetic Sensor:** For detecting live electrical wires. This is the simplest and most reliable part of the system.
- **Capacitive Sensing Array:** For detecting pipes, studs, and other objects. Instead of a single sensor, using an array of a few sensors (e.g., three in a line) allows you to not only detect an object but also determine its rough position and width. This would give the user a more precise indication of where the object is.

Extras

- **Thermal imaging** - Can sometimes detect temperature differences from water flow
- ML for ignoring certain frequencies

3D Printing

Designs

1. Drill-machine clamp extension ⚎
2. Gloves like, you open your palm wide on the wall and it beeps or buzzes on detection