Project Proposal: FPGA-Based UART-Controlled System

1. Introduction

This document presents a project proposal based on two FPGA-based UART themes:

1. UART-Controlled Display System

2. UART-Controlled Actuator System

The goal is to explore real-time communication between a serial interface and hardware components using an FPGA.

2. Theme 1: FPGA-Based UART-Controlled Display System

Overview: Display data received over UART on a 7-segment display or LCD.

Key Objectives:

- Implement UART RX module.

- Interface with display hardware.

- Buffer and synchronize UART input with output display.

Applications: Digital clocks, interactive serial-based UIs.

3. Theme 2: FPGA-Based UART-Controlled Actuator System

Overview: Control actuators via UART serial commands.

Key Objectives:

- Decode command protocols.

- Control outputs like LEDs, motors.

- Ensure hardware-safe operations.

Applications: Home automation, robotics.

4. Literature Review

Several open-source platforms, including Nandland and Pantech Solutions, demonstrate UART-based FPGA control.

Common approaches involve using state machines for command decoding and modular hardware interfacing.

5. System Requirements

Hardware:

- FPGA Board (e.g., Spartan-6 or Artix-7)

- USB-to-UART module

- 7-segment display / LCD / LED / Motor

Software:

- Verilog HDL

- Vivado / ISE

- Serial terminal for testing (Tera Term / PuTTY)

6. System Architecture

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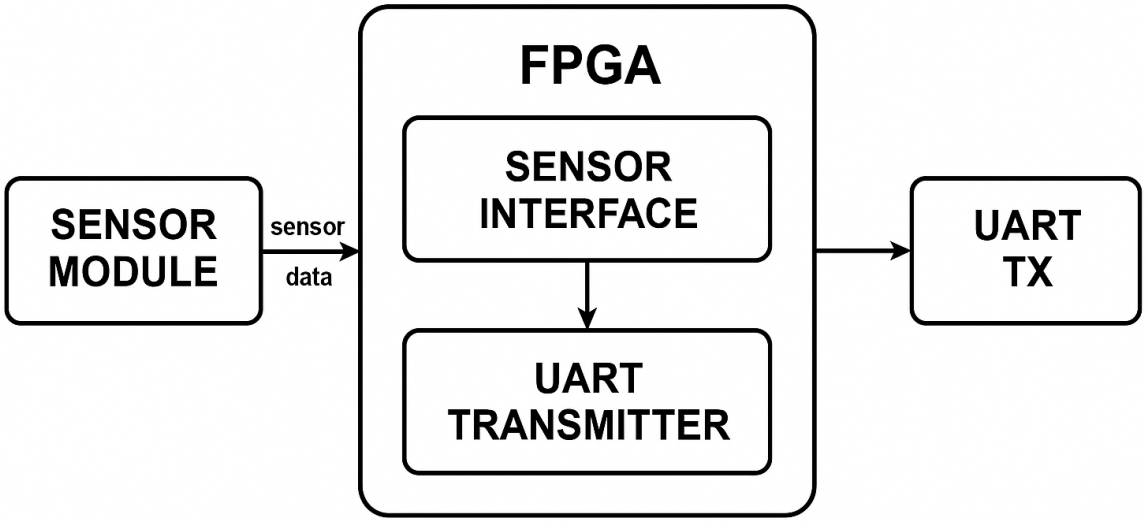

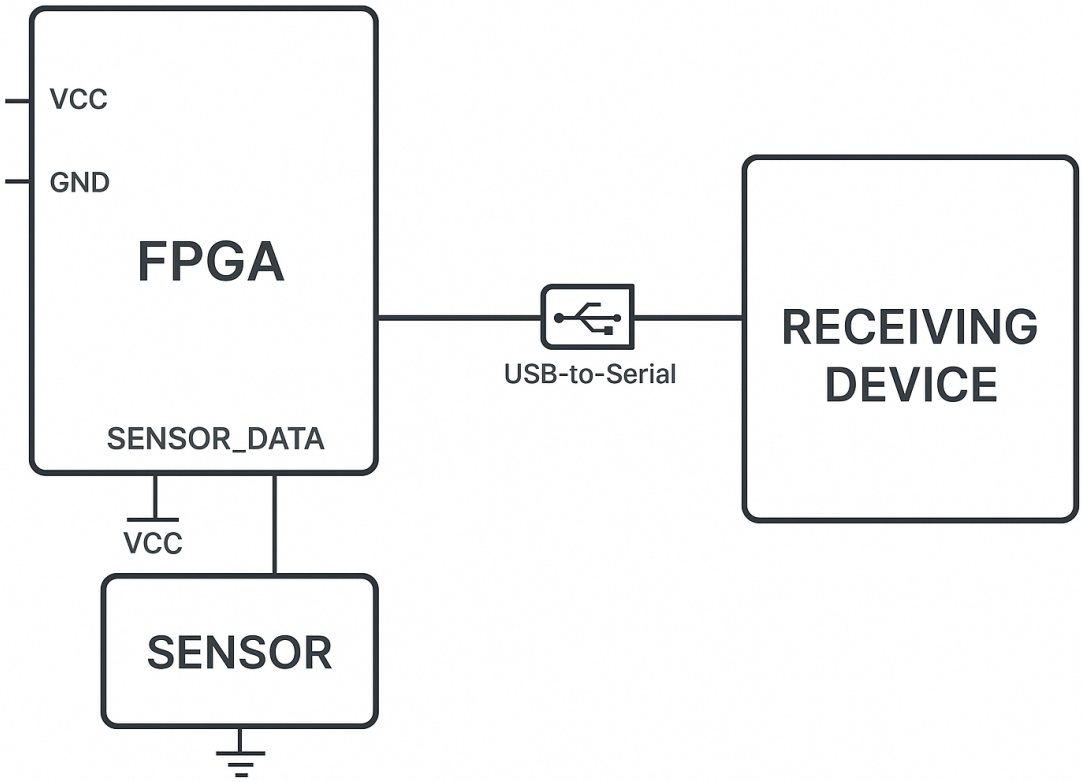

The block diagrams above illustrate UART input going into the FPGA, which then processes and sends

output to either displays or actuators.

7. Project Plan & Timeline

Week 1: Literature review and requirement analysis

Week 2: UART RX module development

Week 3: Hardware interfacing (display or actuator)

Week 4: Full system integration

Week 5: Testing, debugging, and documentation