

Research Project: CS 101: The NYC Tech Design Challenge

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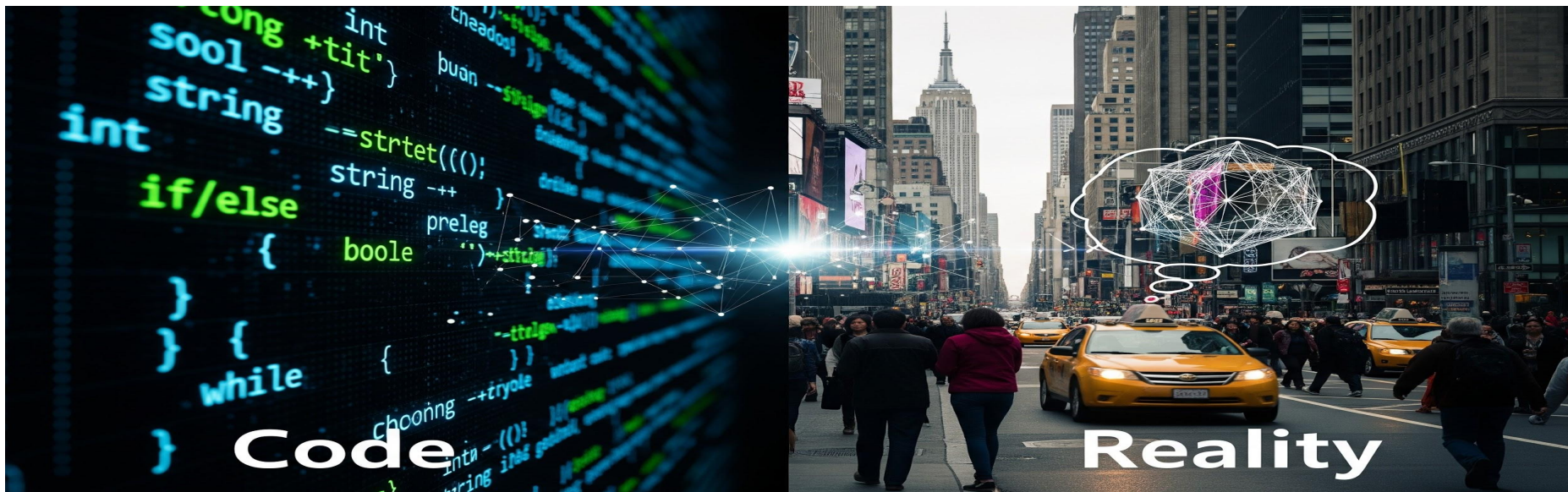
C++ for the Five Boroughs



The Big Idea

From Code to Reality

- **You're learning:** `int`, `string`, `bool`, `if/else`, `while`...
- **The Goal:** Programmers don't just write code. They solve problems.
- **Our Challenge:** How can we use the *logic* of C++ to solve a real problem in NYC?



The "CS 101 Technical Design Doc"

- **Your Mission:** Identify an NYC problem and design a tech solution.
- **Your Deliverable: A Technical Design Document (TDD).** This is a *plan* that software engineers create before writing any code.
- **IMPORTANT:** You will **NOT** be writing a full, running C++ program. You will be designing the *architecture* and the *logic* (in pseudocode).



The TDD (Part 1): The Problem

Step 1: Define the Problem

- **Project Title:** Give it a catchy name.
- **Problem Statement:** What is the *specific* problem?
 - *Bad Example:* "Trash is bad."
 - *Good Example:* "The L train platform at Bedford Ave is dangerously overcrowded between 8:00 AM and 9:30 AM."
- **Who It Affects:** Who experiences this?
 - e.g., Commuters, small business owners, sanitation workers.

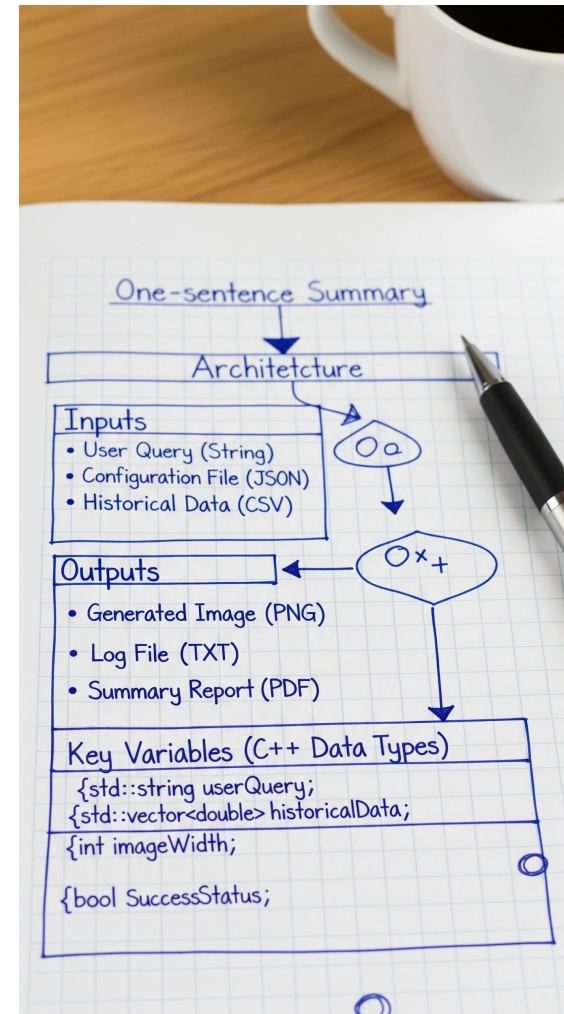


The TDD (Part 2): The Solution

Step 2: Describe Your Solution (High-Level)

- **Solution Summary:** A one-sentence pitch.
 - e.g., "A smart sensor system that tells commuters the *actual* crowd level before they enter the station."
- **Simple "Architecture":**
 - **INPUTS:** What information does your program need?
 - (e.g., Camera data, time of day, user reports)
 - **OUTPUTS:** What does your program *do*?
 - (e.g., Display a message, send a command to a motor)
 - **DATA:** What C++ variables would you need?
 - (e.g., `int passengerCount;`,

`bool isCrowded;`



The TDD (Part 3): The Core Logic

Step 3: Write the Pseudocode

- This is the **heart** of the assignment.
- **Pseudocode** = Structured English. It's logic, without the perfect C++ syntax.
- Focus on the *decisions* your program has to make.
- Use **IF / ELSE IF / ELSE**.
- Use **WHILE** or **FOR** loops.
- Get your **INPUTS** and send your **OUTPUTS**.

```
/// conditional statements  
  
if / ELSE  
Q IF {temperature > {threshold}} ///  
  THEN  
    {turn_on_fan} ← '//' +  
  ELSE {turn_off_fan}  
}  
  
/// pesupioal stetments  
  
WHILE WHILE day_is_not_over:  
Q {  
  {perform_task_A,  
  {perform_task_C} ← '///'  
  
  {check_condition_B}  
  {perform_task_C} ← '///'  
}  
}
```

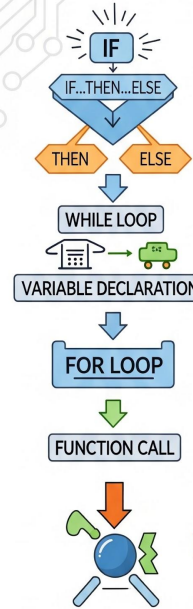
Yellow sticky note: "Increment and decrement these all the variables to adjust."
Blue sticky note: "Increment these first, wait to reset condition."
Blue sticky note: "Variable limit reached, then the following."
Orange sticky note: "Variable limit reached, even as it reset given limit."

The TDD (Part 4): The Connection

Step 4: The C++ Connection

- Finally, explain how your pseudocode maps to C++.
- Example:**
 - "My **WHILE** (**robot_is_on**) **DO**... would be a **while(true)** loop in C++."
 - "My **IF** (**battery < 10**)... would be an **if** statement checking a **float** variable."
 - "The **SEND** **command_to_motor**... would be a C++ function call."

Pseudocode



C++ Translation

if/else statement

while loop
int variable
for loop
else
void function()

```
... else ... { ... }  
}
```

```
int current_passenger_count;
```

My IF..THEN block in pseudocode would become an if/else statement in C++. "current_passenger_count" would be a real int variable.

```
IF current_passenger_count > MAX_CAPACITY  
if (current_passenger_count) < ... > {  
    THEN...  
}  
int current_passenger_count;
```

Logistics & Grading

Assignment: Fill out the `CS101_TDD_Template.md` & Slide Deck Pitch file with Supplementary files from the project.

Submission: Submit the completed file on GitHub.

Due Date: Nov 25th End of Class

Grading:

- Problem Clarity (25%)
- Solution Creativity (25%)
- **Pseudocode Logic (30%)**
- C++ Connection (20%)