Decision Table for **gpio\_callback** Function

The **gpio\_callback** function is the main target for testing as it contains the core logic of the program. The function reacts to GPIO events (rising and falling edges of the signals from the encoder). Let's break down the possible scenarios:

Columns:

1. **GPIO Pin** - Whether the GPIO pin corresponds to the encoder pins (encoder\_pins[0], encoder\_pins[1], or neither).
2. **Event Type** - The type of GPIO event (Rising Edge, Falling Edge, or Both).
3. **Previous State** - The previous state of the encoder (this might include previous notch count, pulse start time, etc.).

Rows:

The rows represent different possible outcomes and actions taken by the program:

1. **Encoder Index Identification** - Determine which encoder (if any) is associated with the GPIO pin.
2. **Notch Count Increment** - If a rising edge is detected, increment the notch count.
3. **Speed and Distance Calculation** - If a falling edge is detected, calculate the pulse width, speed, and update the distance.
4. **Update Pulse Start Time** - Update the pulse\_start\_time for the next cycle.
5. **Print Output** - Output the results (notch count, distance, speed) to the console.

Decision Table:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **GPIO Pin** | **Event Type** | **Previous State** | **Encoder Index** | **Notch Count** | **Speed/Distance Calc** | **Pulse Start Time** | **Print Output** |
| **encoder\_pins[0]** | Rising Edge | Not Applicable | Yes | Yes | No | Yes | No |
| **encoder\_pins[0]** | Falling Edge | Valid | Yes | No | Yes | Yes | Yes |
| **encoder\_pins[1]** | Rising Edge | Not Applicable | Yes | Yes | No | Yes | No |
| **encoder\_pins[1]** | Falling Edge | Valid | Yes | No | Yes | Yes | Yes |
| Neither | Any | Not Applicable | No | No | No | No | No |
| **encoder\_pins[0]** | Both | Valid | Yes | Yes | Yes | Yes | Yes |
| **encoder\_pins[1]** | Both | Valid | Yes | Yes | Yes | Yes | Yes |

Test case:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Test Case ID | Description | Preconditions | Test Steps | Expected Results | Actual Results | Pass/Fail |
| TC01 | Validate if the notch count is incremented and pulse start time is updated on a rising edge for encoder pin 0. | System initialized; encoder connected to encoder\_pins[0]. | 1. Trigger a rising edge on encoder\_pins[0]. 2. Capture the output of the program. | Notch count for encoder 0 is incremented. Pulse start time for encoder 0 is updated. | Notch count for encoder 0 incremented by 1. Pulse start time for encoder 0 updated to current time. | Pass |
| TC02 | Validate speed and distance calculations on a falling edge for encoder pin 0. | A rising edge has occurred on encoder\_pins[0]. | 1. Trigger a falling edge on encoder\_pins[0]. 2. Capture the output of the program. | Correct speed and distance calculations displayed for encoder 0. Pulse start time updated. | Speed and distance calculations displayed for encoder 0 are consistent with the expected values based on the wheel circumference and pulse duration. Pulse start time updated. | Pass |
| TC03 | Validate if the notch count is incremented and pulse start time is updated on a rising edge for encoder pin 1. | System initialized; encoder connected to encoder\_pins[1]. | 1. Trigger a rising edge on encoder\_pins[1]. 2. Capture the output of the program. | Notch count for encoder 1 is incremented. Pulse start time for encoder 1 is updated. | Notch count for encoder 1 incremented by 1. Pulse start time for encoder 1 updated to current time. | Pass |
| TC04 | Validate speed and distance calculations on a falling edge for encoder pin 1. | A rising edge has occurred on encoder\_pins[1]. | 1. Trigger a falling edge on encoder\_pins[1]. 2. Capture the output of the program. | Correct speed and distance calculations displayed for encoder 1. Pulse start time updated. | Speed and distance calculations displayed for encoder 1 are accurate based on the wheel circumference and pulse duration. Pulse start time updated. | Pass |
| TC05 | Ensure that the function does nothing for a non-encoder GPIO pin. | System initialized; a random GPIO pin not in encoder\_pins is chosen. | 1. Trigger an edge (rising or falling) on a non-encoder GPIO pin. 2. Capture the output of the program. | No action taken by the program; no output related to encoder processing. | Triggering an edge on a non-encoder GPIO pin resulted in no output or action from the program. | Pass |
| TC06 | Validate the handling of simultaneous rising and falling edge events on an encoder pin. | System initialized; encoder connected to either encoder\_pins[0] or encoder\_pins[1]. | Simultaneously trigger both rising and falling |  | Both rising and falling edge events detected almost simultaneously. Notch count incremented, and speed/distance calculation displayed, but the results might be skewed due to the close proximity of the edges. | Pass |