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1 import tkinter as tk
2 from tkinter import messagebox
3 import serial
4 import threading
5 import queue
6 import time
7
8 import matplotlib.pyplot as plt
9 from matplotlib.backends.backend_tkagg import FigureCanvasTkAgg
10
11 # ===== SERIAL CONFIG =====
12 SERIAL_PORT = "COM3"
13 BAUD_RATE = 9600
14
15 try:
16     ser = serial.Serial(SERIAL_PORT, BAUD_RATE, timeout=1)
17 except Exception as e:
18     messagebox.showerror("Serial Error", str(e))
19     raise SystemExit
20
21 # ===== GLOBALS =====
22 data_queue = queue.Queue()
23 running = True
24
25 # ===== SEND DATA =====
26 def send_data():
27     data = entry.get().strip()
28     if data:
29         ser.write((data + "\n").encode())
30         text_box.insert(tk.END, f"Sent: {data}\n")
31         entry.delete(0, tk.END)
32
33 # ===== SERIAL THREAD =====
34 def read_serial():
35     while running:
36         try:
37             line = ser.readline().decode(errors="ignore").strip()
38             if line:
39                 data_queue.put(line)
40         except:
41             pass
42
43 # ===== GUI UPDATE =====
44 x_data, y_data = [], []
45 start_time = time.time()
46
47 def update_gui():
48     while not data_queue.empty():
49         line = data_queue.get()
50
51         text_box.insert(tk.END, f"Received: {line}\n")
52         text_box.see(tk.END)
53
54         # Limit text lines
55         if int(text_box.index('end-1c').split('.')[0]) > 200:
56             text_box.delete("1.0", "2.0")
57
58         try:
59             value = float(line)
60             x_data.append(time.time() - start_time)
61             y_data.append(value)
62
63             if len(x_data) > 100:
64                 x_data.pop(0)
65                 y_data.pop(0)
66
67             line_plot.set_data(x_data, y_data)
68             ax.relim()
69             ax.autoscale_view()
70             canvas.draw_idle()
71
72         except ValueError:
```

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73         pass
74
75     root.after(100, update_gui)
76
77 # ===== CLOSE HANDLER =====
78 def on_close():
79     global running
80     running = False
81     time.sleep(0.2)
82     ser.close()
83     root.destroy()
84
85 # ===== TKINTER UI =====
86 root = tk.Tk()
87 root.title("Serial Communication with Live Plot")
88 root.geometry("900x600")
89 root.protocol("WM_DELETE_WINDOW", on_close)
90
91 top_frame = tk.Frame(root)
92 top_frame.pack(pady=10)
93
94 entry = tk.Entry(top_frame, width=30)
95 entry.pack(side=tk.LEFT)
96
97 send_button = tk.Button(top_frame, text="Send", command=send_data)
98 send_button.pack(side=tk.LEFT, padx=5)
99
100 text_box = tk.Text(root, height=10)
101 text_box.pack(padx=10, pady=10, fill=tk.X)
102
103 # ===== MATPLOTLIB =====
104 fig, ax = plt.subplots(figsize=(7, 4))
105 line_plot, = ax.plot([], [], lw=2)
106 ax.set_title("Live Serial Data")
107 ax.set_xlabel("Time (s)")
108 ax.set_ylabel("Value")
109
110 canvas = FigureCanvasTkAgg(fig, master=root)
111 canvas.get_tk_widget().pack(fill=tk.BOTH, expand=True)
112
113 # ===== START =====
114 threading.Thread(target=read_serial, daemon=True).start()
115 root.after(100, update_gui)
116 root.mainloop()
117

```