Globalni navigacijski sustavi - 3. Labos

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1 Zadatak

Inercijski navigacijski sustav:

1) Uređaj je kroz cijelo gibanje okrenut prema sjeveru, pretpostavlja se jednoliko gibanje od početka, gibanje prikazano crnom bojom

2) Uređaj je kroz cijelo gibanje okrenut u smjeru gibanja, pretpostavlja se jednoliko gibanje od početka, gibanje prikazano plavom bojom

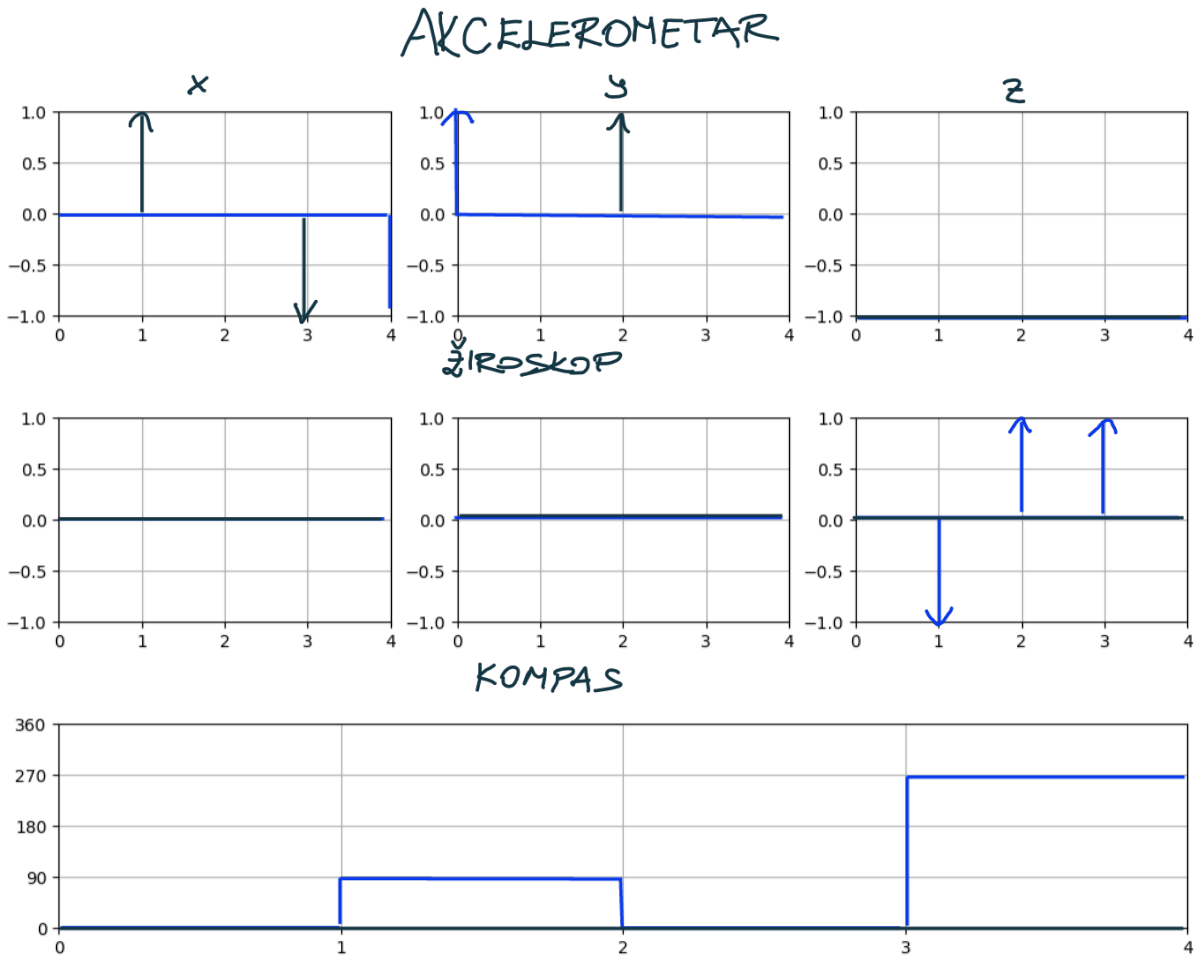

Figure 1: Prikaz vrijednosti senzora

2 Zadatak

Okvirna lokacija mobilnog uređaja je: [9.33526697 6.7622772]

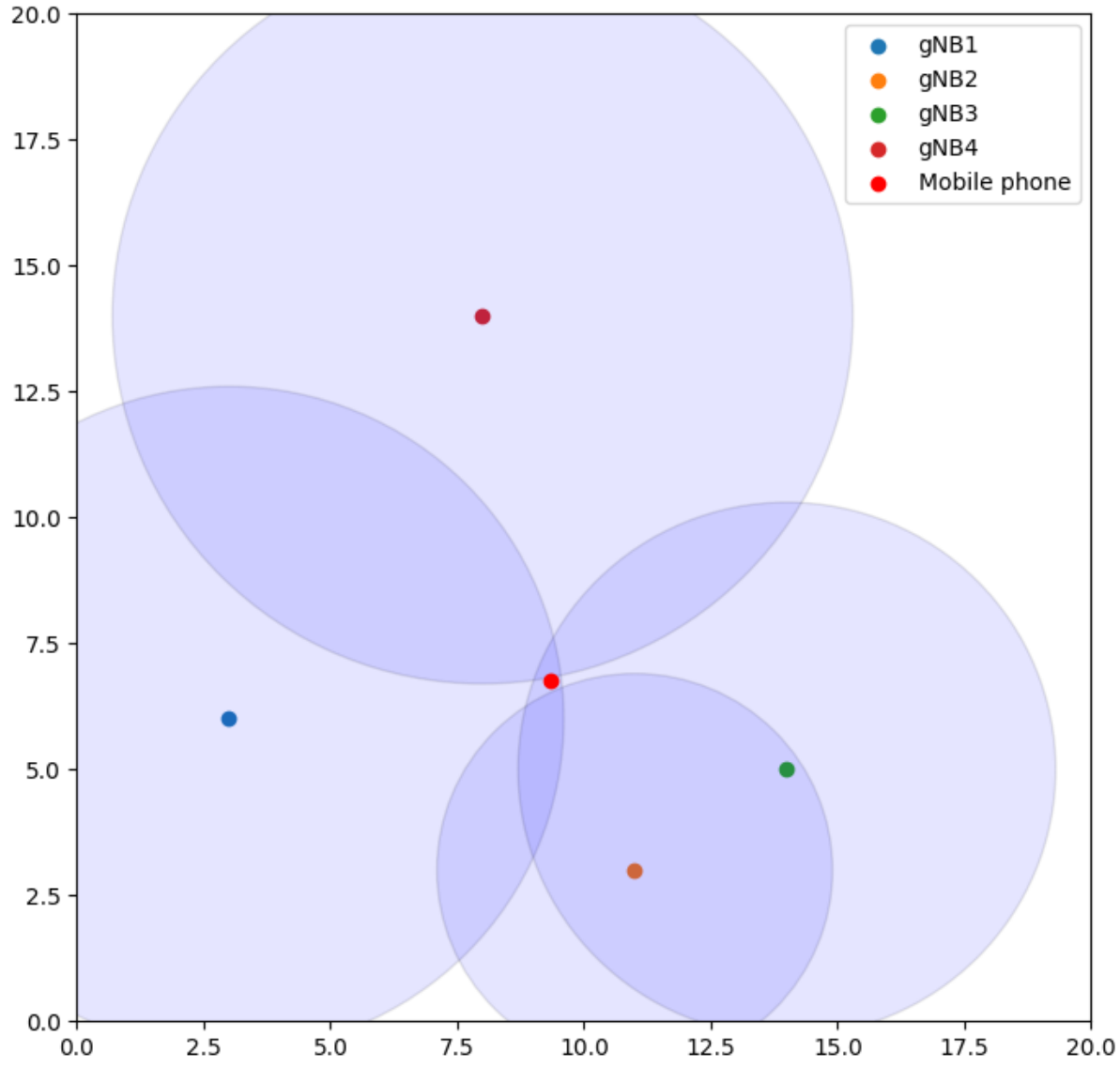

Figure 2: Vizualizacija lokacije

Listing 1: Python code

```
import numpy as np
from scipy.optimize import least_squares
import matplotlib.pyplot as plt


base_stations = {
    "gNB1": {"coordinates": (3, 6), "distance": 6.6},
    "gNB2": {"coordinates": (11, 3), "distance": 3.9},
    "gNB3": {"coordinates": (14, 5), "distance": 5.3},
```

```
    "gNB4": {"coordinates": (8, 14), "distance": 7.3},
}

def objective_function(coordinates, distances):
    return np.sqrt(np.sum((np.linalg.norm(coordinates - distances[:, 0:2],
        axis=1) - distances[:, 2])**2))

initial_guess = np.array([0, 0])
distances = np.array([list(station["coordinates"]) + [station["distance"]] for
    station in base_stations.values()])
result = least_squares(objective_function, initial_guess, args=(distances,))
print("Okvirna lokacija je: (x, y):", result.x)

fig = plt.figure(figsize=(8, 8))

i=1
for station in base_stations.values():
    plt.scatter(*station["coordinates"], label="gNB" + str(i))
    circle = plt.Circle(station["coordinates"], station["distance"],
        fill=True, facecolor='blue', alpha=0.1, edgecolor='black')
    plt.gca().add_patch(circle)
    i=i+1

plt.scatter(*result.x, color="red", label="Mobile phone")

plt.xlim(0, 20)
plt.ylim(0, 20)
plt.legend()
plt.show()
```