

FACILITY MAPPING IN HOSPITALS FOR THE PUBLIC TO TRACK AND USE.

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COURSE: Code Optimization and Debugging

PROBLEM STATEMENT:

Facility mapping in Hospitals for public to track and use.

AIM:

To develop facility mapping in hospitals for the public to track and use.

ABSTRACT:

By definition, hospital sub-populations have different abilities and very different needs – depending on their purpose at the hospital and their status (e.g. whether they are immunosuppressed, contagious, a nurse, a porter, etc.). It is critical that hospitals meet their functional needs – that their design and resources enable patients to receive their intended treatment in a timely manner, that staff are able to fulfil their responsibilities and also, as with any occupied building, that it provides the required level of life safety for the entire population under emergency scenarios.

INTRODUCTION

It is apparent that the design and management of the physical space, the human/technological resources and the management of people movement throughout a hospital given these considerations poses an enormous task. The impact of design changes on the safety and comfort of patients and staff may not be intuitive or accessible to direct analysis. This impact may therefore require simulation – to identify influential factors, when and where they have an influence, and the local/global impact of this influence. This is to assess performance and support recommendations for improvement. This article outlines the use of engineering and computational models to assess the effectiveness of hospital design and management procedures across a range of emergency and non-emergency scenarios. This use is intended to identify influential factors, enable comparison of key performance indicators, and to map these outcomes to communicate these results in an intuitive manner.

OBJECTIVES

1. Design a system for better patient care.
2. Better co-ordination among the different departments.
3. Provide top management a single point of control.
4. Reduce hospital operating costs.

Hospital management System handles activities of major departments like:

1. Patient management (scheduling, registration and long-term care).
2. Patient care management and departmental modules (radiology, pharmacy and pathology labs).
3. Billing.
4. Medical Stores.

PROCEDURE

- Quick Campus Mapping: Outdoor maps of a facility with mobile access, outdoor tracking, and situational awareness across the campus.
- Indoor Facility Mapping: Indoor floorplans of buildings on the campus with room level information, and outdoor tracking and wayfinding.
- Indoor Facility GIS: Indoor routing, wayfinding, tracking, and analytics, supporting advanced space and asset management use cases such as asset locations, movement, and exposure inside a facility.

In addition to emergency response missions requiring better facility maps, businesses and government offices are also looking for better information about employee work locations, proximity, and building use pattern inside their workplace. The same principals outlined above can be used, especially Level 2, to quickly create maps of employee status (eg locations in the office where workers are on site vs working virtually). In Level 3 workflows, facility managers can use tracking to understand the locations visited that may need to be cleaned or, in the case of exposure, the locations of contact and possible spread.

METHODOLOGY

- 1) Indoor Navigation: To make finding a location or asset easier, ArcGIS Indoors can navigate patients and employees through mazes of buildings and across campuses, upstairs, downstairs, and in consideration of disabilities, delivering turn-by-turn navigation on mobile phones or through kiosks.
- 2) Resource Management: With an increased demand for medical services, hospitals strive for **maximum operational efficiency**. Patient throughput and capacity management are daily concerns confronting healthcare organizations.
- 3) Building Maintenance Management: Fact – reactive maintenance is many times more costly than proactive maintenance. Hospitals that lack a common operational dataset to manage their facilities incur costs in service technician and employee time as well as high risk costs of deferred maintenance.
- 4) Live Asset Tracking: Each day hospital staff spend hours searching for necessary hospital equipment like IV poles and wheelchairs. Sometimes, this equipment is permanently lost or stolen, adding to the cost of replacement.
- 5) Safety and Security: Hospitals are high stress places and by their nature are subject to security incidents and possible violence. Hospitals need to prioritize security measures and enhance patient and visitor safety. ArcGIS Indoors gives you the ability to interface with real-time information such as incidents and location of personnel, allowing users to make smarter decisions.

the methodology for facility mapping in healthcare involves a systematic process that includes defining the scope and objectives, collecting and verifying data, analyzing the data, creating the map, and maintaining and updating the map. This process can provide valuable information to healthcare organizations, policymakers, and the public to improve access to healthcare services and promote better health outcomes.

PROGRAM

```
import folium
from folium import plugins
import pandas as pd

import ipywidgets
import os
import json

import datetime
UMMlocation = (49.49216583285166, 8.484229445457458)
map_UMM = folium.Map(location = UMMlocation, width = "75%", zoom_start = 17) #
max zoom: 18
map_UMM
startTime=int(datetime.timedelta(minutes=6, seconds=30).total_seconds())
hauseOutline = 'HospitalNavigator/GeoResources/Haus22.geojson'
display(folium.GeoJson(hauseOutline, name="Haus22").add_to(map_UMM))
display(map_UMM)
testGeoJson = 'HospitalNavigator/GeoResources/path/w17.geojson'
def switchPosition(coordinate):
    temp = coordinate[0]
    coordinate[0] = coordinate[1]
    coordinate[1] = temp
    return coordinate
with open(testGeoJson) as f:
    testWay = json.load(f)

for feature in testWay['features']:
    path = feature['geometry']['coordinates']
    finalPath = list(map(switchPosition,path))
    finalPath
    path = 'HospitalNavigator/GeoResources/path/w17.geojson'
    folium.plugins.AntPath([[49.49213534374249, 8.484166413545609],
    [49.49232786037041, 8.484299182891846],
    [49.49233047371309, 8.484493643045425],
    [49.492218099851804, 8.484871834516525],
    [49.49142363542676, 8.487555384635925],
    [49.49185222967887, 8.487834334373474],
    [49.491712849846046, 8.488343954086304],
    [49.492029938390125, 8.488638997077942],
    [49.49251776290861, 8.488982319831848],
    [49.49222506878094, 8.489341735839844],
    [49.49217977072383, 8.489529490470886],
    [49.49220764645621, 8.489856719970703]]).add_to(map_UMM)
    map_UMM
```

```

class navigator:
    def __init__(self):
        self.geoResources = {}
        self.hospitalLocation =(49.49226339787344, 8.487303256988524)
        self.position = 'w'
        self.destination = 'Haus17'

        for root, dirs, files in os.walk('HospitalNavigator/GeoResources'):
            for file in files:
                self.geoResources[file.split('.')[0]] = root+'/'+file

    def changeDestination(self,newDestination):
        self.destination = newDestination
        self.redrawMap()

    def changeStartPoint(self, newStartPoint):

        #self.position = newStartPoint #does not work yet
        print(f'Selected Start: {newStartPoint}; Selected Target: {self.destination}')
        #self.redrawMap()

    def drawPathWay(self,hospitalMap):

        def switchPosition(coordinate):
            temp = coordinate[0]
            coordinate[0] = coordinate[1]
            coordinate[1] = temp
            return coordinate

        searchString = self.position + self.destination.split('Haus')[1]
        with open(self.geoResources[searchString]) as f:
            testWay = json.load(f)

        for feature in testWay['features']:
            path = feature['geometry']['coordinates']

        finalPath = list(map(switchPosition,path))
        folium.plugins.AntPath(finalPath).add_to(hospitalMap)

    def drawBuilding(self,hospitalMap):
        hauseOutline = self.geoResources[self.destination]
        folium.GeoJson(hauseOutline, name="geojson").add_to(hospitalMap)

    def redrawMap(self):
        #print(f'position {self.position}, destination {self.destination}')

```

```

        hospitalMap = folium.Map(location = self.hospitalLocation, width = "75%",
zoom_start = 17)
        self.drawPathWay(hospitalMap)
        self.drawBuilding(hospitalMap)
        display(hospitalMap)
myNavigator = navigator()
def displayWay(whereTo):
    myNavigator.changeDestination(whereTo)
def changePosition(whereFrom):
    myNavigator.changeStartPoint(whereFrom)

```

Position Selector

```

selectPosition_widget=ipywidgets.Select(
    options=['Aufnahme', 'Eingang West', 'Eingang Ost', 'Eingang Fahrzeuge'],
    value='Eingang West',
    description='Start',
    disabled=False)

```

```

def selectPosition(position):
    if position == 'Aufnahme':
        changePosition('a')
    if position == 'Eingang West':
        changePosition('w')
    if position == 'Eingang Ost':
        changePosition('o')
    if position == 'Eingang Fahrzeuge':
        changePosition('f')

```

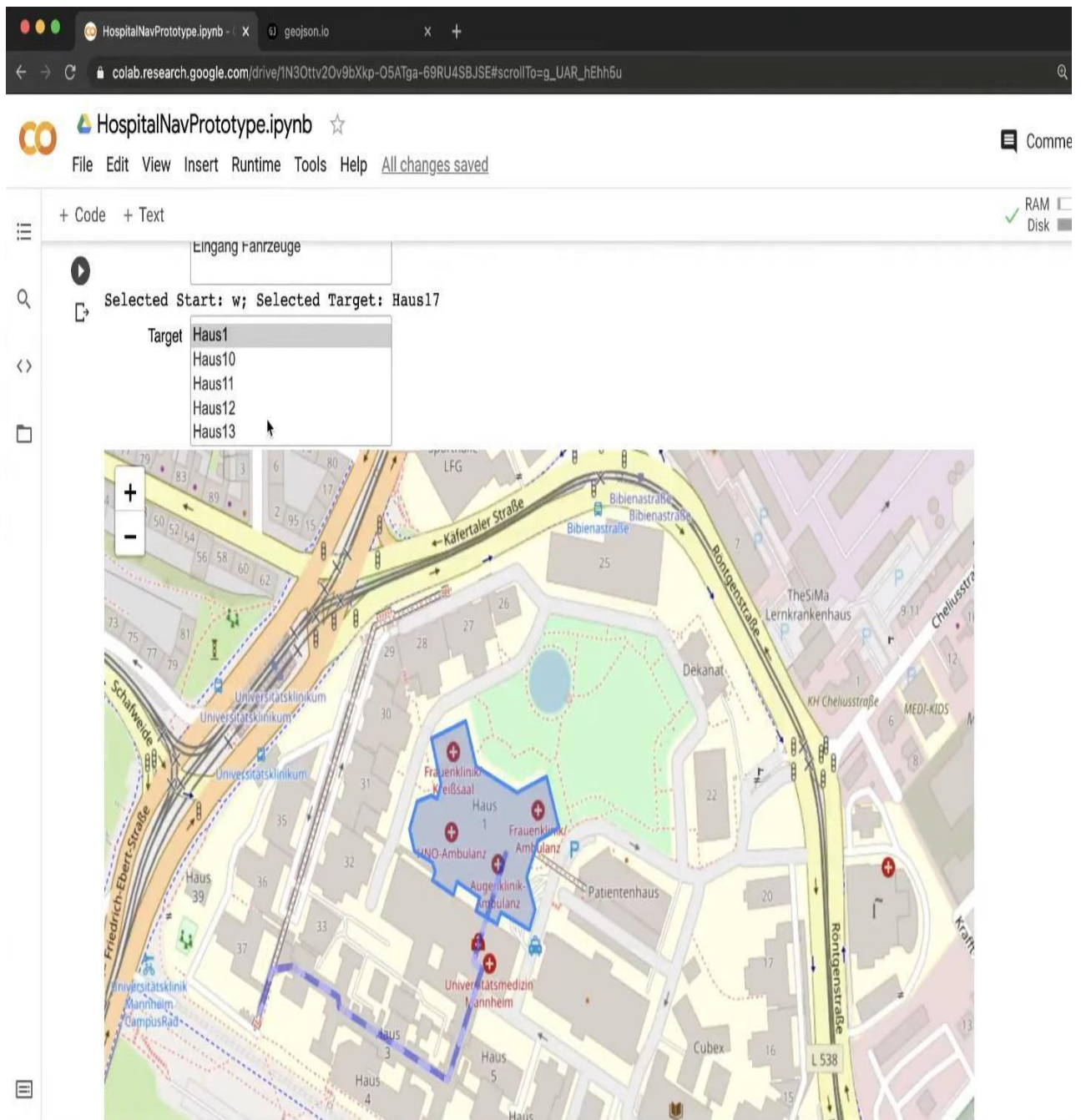
```

ipywidgets.interact(selectPosition, position=selectPosition_widget)
ipywidgets.interact(selectHouse, way=selectHouse_widget)

```

OUTPUT:

(SCREENSHOT)



CONCLUSION

Facility mapping in healthcare is an important tool that can provide valuable information to the public about healthcare facilities in their area. By mapping healthcare facilities, people can easily locate and access healthcare services, which can lead to improved health outcomes and better overall health for the community.

Facility mapping in healthcare can provide numerous benefits to the public, including improved access to healthcare services, better health outcomes, and increased transparency and accountability. By embracing facility mapping as a tool for public engagement and healthcare planning, healthcare organizations can better serve their communities and promote better health for all.

RESULT

Facility mapping in healthcare for public to track and use is developed and executed successfully.