Path Planning Agent
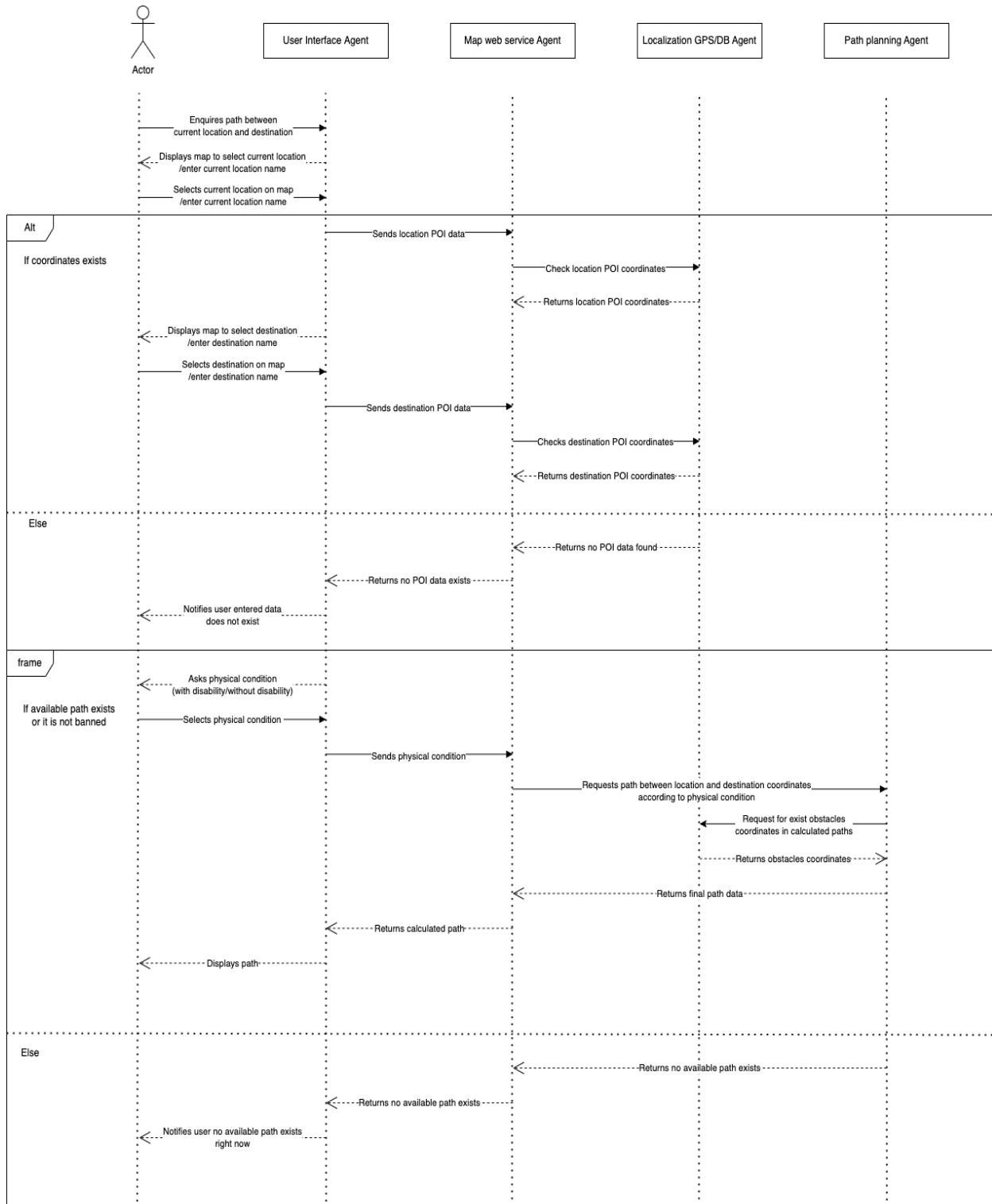
SENG 696 - Assignment 2

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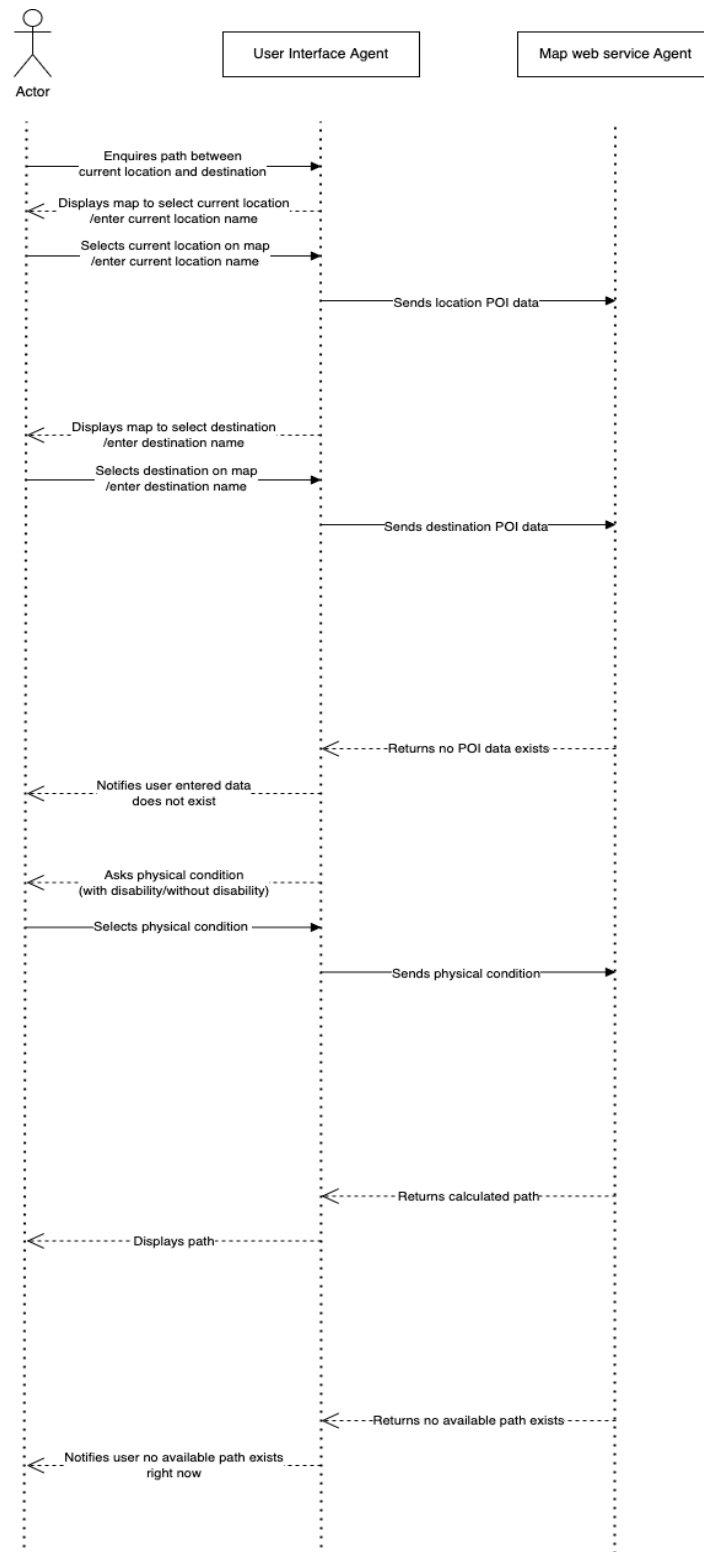# Overall Message Sequence Diagram

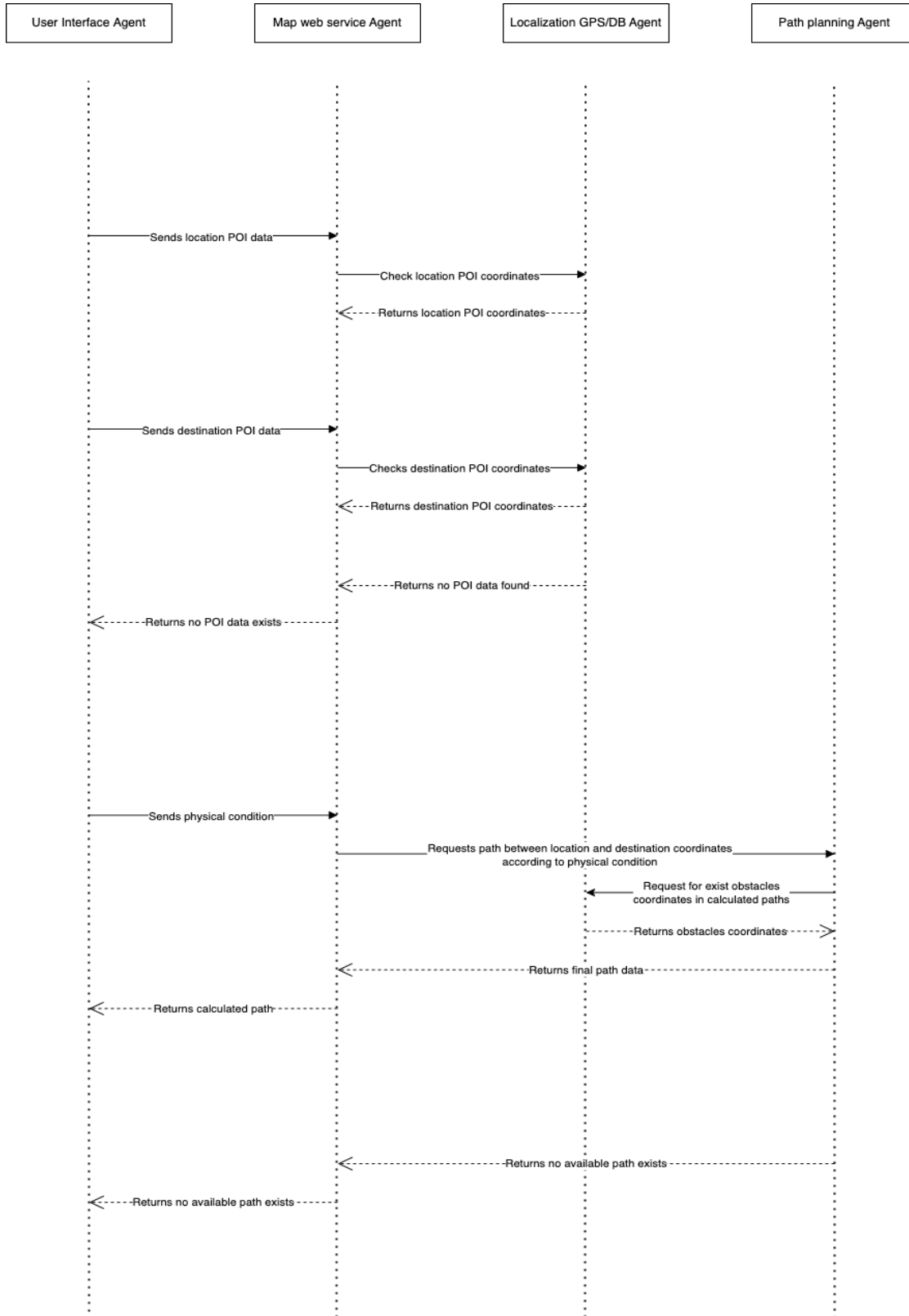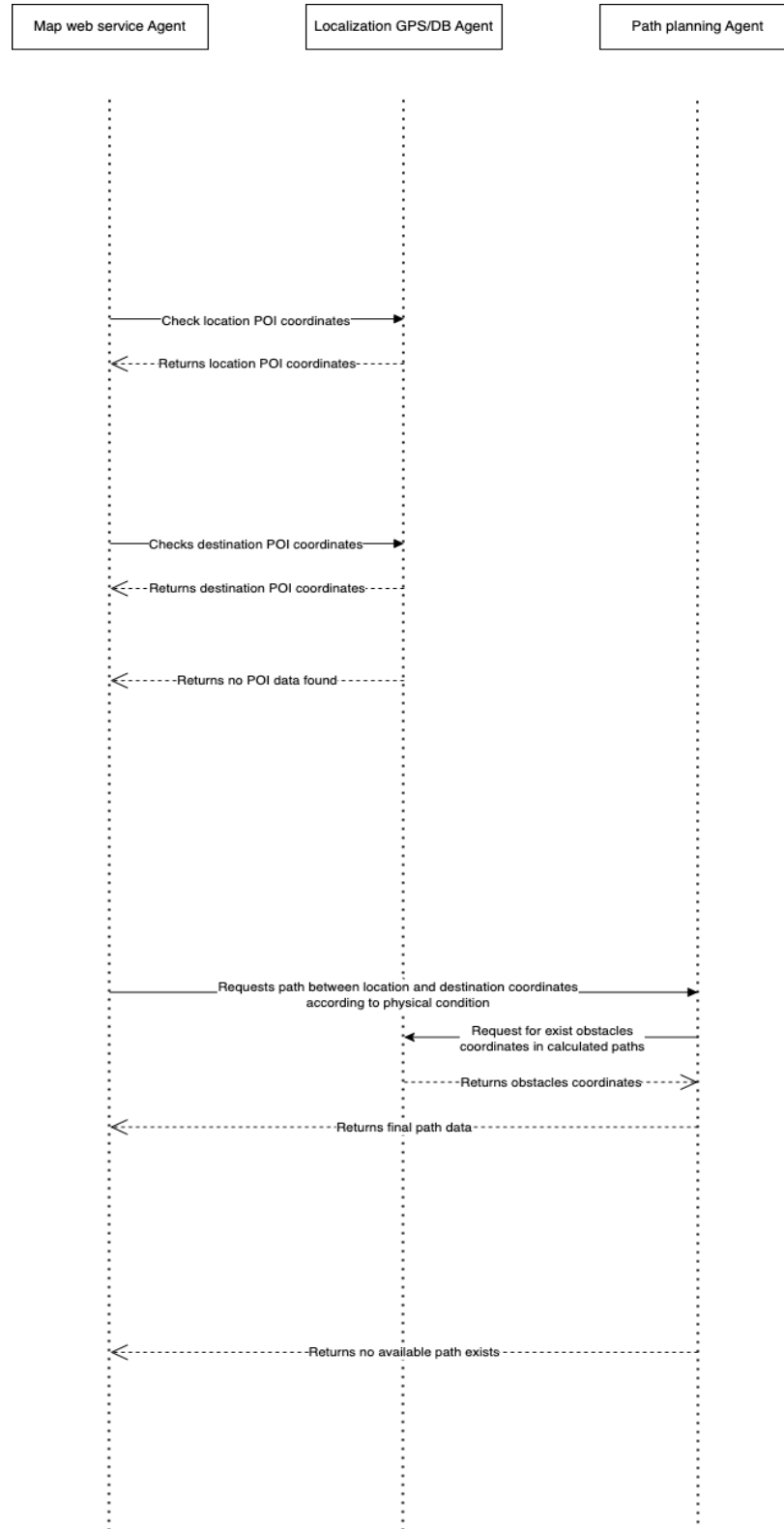**Actor** | **User Interface Agent** | **Map web service Agent** | **Localization GPS/DB Agent** | **Path planning Agent**

Actor → User Interface Agent: Enquires path between current location and destination

User Interface Agent → Actor: Displays map to select current location /enter current location name

Actor → User Interface Agent: Selects current location on map /enter current location name

Alt

If coordinates exists

User Interface Agent → Map web service Agent: Sends location POI data

Map web service Agent → Localization GPS/DB Agent: Check location POI coordinates

Localization GPS/DB Agent --> Map web service Agent: Returns location POI coordinates

User Interface Agent → Actor: Displays map to select destination /enter destination name

Actor → User Interface Agent: Selects destination on map /enter destination name

User Interface Agent → Map web service Agent: Sends destination POI data

Map web service Agent → Localization GPS/DB Agent: Checks destination POI coordinates

Localization GPS/DB Agent --> Map web service Agent: Returns destination POI coordinates

Else

Localization GPS/DB Agent --> Map web service Agent: Returns no POI data found

Map web service Agent --> User Interface Agent: Returns no POI data exists

User Interface Agent --> Actor: Notifies user entered data does not exist

frame

If available path exists or it is not banned

User Interface Agent → Actor: Asks physical condition (with disability/without disability)

Actor → User Interface Agent: Selects physical condition

User Interface Agent → Map web service Agent: Sends physical condition

Map web service Agent → Path planning Agent: Requests path between location and destination coordinates according to physical condition

Path planning Agent → Localization GPS/DB Agent: Request for exist obstacles coordinates in calculated paths

Localization GPS/DB Agent --> Path planning Agent: Returns obstacles coordinates

Path planning Agent --> Map web service Agent: Returns final path data

Map web service Agent --> User Interface Agent: Returns calculated path

User Interface Agent --> Actor: Displays path

Else

Path planning Agent --> Map web service Agent: Returns no available path exists

Map web service Agent --> User Interface Agent: Returns no available path exists

User Interface Agent --> Actor: Notifies user no available path exists right now

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Use Cases

User Interface Agent Use Case:

```
   ○
  /|\                      ┌──────────────────────┐        ┌──────────────────────┐
   |                       │  User Interface Agent │        │  Map web service Agent│
  / \                      └──────────────────────┘        └──────────────────────┘
 Actor
   │                                  ┊                                ┊
   │      Enquires path between       ┊                                ┊
   │─────current location and destination───▶                         ┊
   │                                  ┊                                ┊
   │◀─ ─ Displays map to select current location ─ ─                   ┊
   │      /enter current location name┊                                ┊
   │                                  ┊                                ┊
   │      Selects current location on map                              ┊
   │─────  /enter current location name ───▶                          ┊
   │                                  ┊                                ┊
   │                                  ┊──────Sends location POI data──────▶
   │                                  ┊                                ┊
   │                                  ┊                                ┊
   │◀─ ─Displays map to select destination─ ─                          ┊
   │       /enter destination name    ┊                                ┊
   │                                  ┊                                ┊
   │        Selects destination on map┊                                ┊
   │─────    /enter destination name ───▶                             ┊
   │                                  ┊                                ┊
   │                                  ┊─────Sends destination POI data────▶
   │                                  ┊                                ┊
   │                                  ┊                                ┊
   │                                  ┊◀─ ─Returns no POI data exists─ ─ ┊
   │                                  ┊                                ┊
   │◀─ ─ Notifies user entered data ─ ┊                                ┊
   │          does not exist          ┊                                ┊
   │                                  ┊                                ┊
   │◀─ ─    Asks physical condition ─ ┊                                ┊
   │     (with disability/without disability)                          ┊
   │                                  ┊                                ┊
   │───── Selects physical condition ─▶                               ┊
   │                                  ┊                                ┊
   │                                  ┊──────Sends physical condition─────▶
   │                                  ┊                                ┊
   │                                  ┊                                ┊
   │                                  ┊◀─ ─Returns calculated path─ ─ ─ ┊
   │                                  ┊                                ┊
   │◀─ ─      Displays path ─ ─ ─ ─ ─ ┊                                ┊
   │                                  ┊                                ┊
   │                                  ┊                                ┊
   │                                  ┊◀─ ─Returns no available path exists─ ─
   │                                  ┊                                ┊
   │◀─ ─Notifies user no available path exists                        ┊
   │            right now             ┊                                ┊
   │                                  ┊                                ┊
```

Map web service Agent Use Case:

User Interface Agent	Map web service Agent	Localization GPS/DB Agent	Path planning Agent

Sends location POI data →

Check location POI coordinates →

← Returns location POI coordinates

Sends destination POI data →

Checks destination POI coordinates →

← Returns destination POI coordinates

← Returns no POI data found

← Returns no POI data exists

Sends physical condition →

Requests path between location and destination coordinates according to physical condition →

← Request for exist obstacles coordinates in calculated paths

Returns obstacles coordinates →

← Returns final path data

← Returns calculated path

← Returns no available path exists

← Returns no available path exists

Localization GPS/DB Agent Use Case:


```
┌──────────────────────┐     ┌──────────────────────┐     ┌──────────────────────┐
│  Map web service Agent │     │ Localization GPS/DB Agent │     │  Path planning Agent   │
└──────────────────────┘     └──────────────────────┘     └──────────────────────┘
          │                           │                           │
          │─── Check location POI coordinates ──>│                           │
          │                           │                           │
          │<─── Returns location POI coordinates ───│                           │
          │                           │                           │
          │─── Checks destination POI coordinates ──>│                           │
          │                           │                           │
          │<─── Returns destination POI coordinates ───│                           │
          │                           │                           │
          │<─── Returns no POI data found ───│                           │
          │                           │                           │
          │─── Requests path between location and destination coordinates ───────────>│
          │       according to physical condition                                     │
          │                           │<── Request for exist obstacles ──│
          │                           │    coordinates in calculated paths │
          │                           │── Returns obstacles coordinates ──>│
          │<─── Returns final path data ───│                           │
          │                           │                           │
          │<─── Returns no available path exists ─────────────────────│
          │                           │                           │
```

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Path planning Agent Use Case:


```
Map web service Agent        Localization GPS/DB Agent        Path planning Agent

            ────Check location POI coordinates────▶

            ◀----Returns location POI coordinates------



            ────Checks destination POI coordinates───▶

            ◀----Returns destination POI coordinates-----


            ◀--------Returns no POI data found---------




                    Requests path between location and destination coordinates
                                 according to physical condition                    ──▶

                                                    Request for exist obstacles
                                                    coordinates in calculated paths  ◀──

                                                    ◀------Returns obstacles coordinates------▶

            ◀------Returns final path data------------------




            ◀-------Returns no available path exists-----------------
```

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Use Cases Definition

User Interface Agent Use Case Definition:

Brief description:	The actor uses this use case to request path.
Precondition:	The actor uses a map web service.
Postcondition:	If all rules are successfully met, then actor will be able to access the path.
Process Steps	
1	The actor makes a request to find a path by selecting current location, destination on the map/entering current location, destination and selects physical condition type.
2	The UI collects actor preferences like location, destination, and physical condition type.
3	The UI sends location and destination's Point of Interest data to the map web service agent.
4	The UI receives calculated data from Map web service Agent.
5	The UI displays a path for the actor on the map based on received data from map service agent.

Exceptions		
1a	The system is not accessible at this moment.	Error message is generated stating that system is not accessible at this moment.
4a	The data for selected POI does not exist.	Error message is generated stating that system does not have data.
5a	The system can not find a path.	Message is generated. 1. Path is not accessible. 2. There is no path between selected points.
Relationship:		

Initiating	Actor
Collaborating	Map web service
Other diagrams:	
Data requirements:	
Data Required:	current location data - destination data - physical condition type

Map service Agent Definition:

Brief description:	The user interface requests a path from map web service agent.
Precondition:	The user interface collects POI data from the actor.
Postcondition:	The selected points POI data should exist.
Process Steps	
1	The map web service agent revives a path request from the UI.
2	The map web service agent requests location and destination's POI coordinates from the localization GPS/DB agent.
3	The map web agent receives location and destination POI coordinates from the localization GPS/DB agent.
4	The map web service sends physical condition type to the path planning agent.
5	The map web agent receives a path data based on received data from path planning agent.
6	The map service agent sends path data to the user interface agent.
Exceptions		
2a	The system is not accessible at this moment.	Error message is generated stating that system is not accessible at this moment.

3a	The system does not have provided points data.	Error message is generated stating that system does not have provided points data.
5a	There is no accessible path between selected points.	Error message is generated stating that the path is banned, or there is no path between selected points.
6a	The system shows there is no path between selected points.	Error message is generated stating that the path is banned, or there is no path between selected points. 1. Path is not accessible. 2. There is no path between selected points.

Relationship:	
Initiating	UI agent
Collaborating	Localization GPS/DB agent - Path planning agent

Other diagrams:	

Data requirements:	
Data Required:	current location coordinates - destination coordinates - physical condition type – path data

Localization GPS/DB Agent Use Case Definition:

Brief description:	The localization GPS/DB agent provides selected points coordinates.
Precondition:	The map web service agent receives POI data from the UI.
Postcondition:	The selected points POI data should exist.
Process Steps	

1	The Localization GPS/DB agent receives a request from map web service agent for current location and destination POI coordinates.
2	The Localization GPS/DB agent sends current location and destination POI coordinates to map web service agent.
3	The Localization GPS/DB agent receives a request from the path planning agent to provide obstacle coordinates in calculated path.
4	The Localization GPS/DB agent sends obstacle coordinates in calculated path.

Exceptions		
2a	The system does not have points coordinates.	Error message is generated stating that system does not have points coordinates.

Relationship:	
Initiating	Map web service agent
Collaborating	Path planning agent

Other diagrams:	

Data requirements:	
Data Required:	current location POI - destination POI – path data

Path Planning Agent Use Case Definition:

Brief description:	The path planning agent provide path between current location and destination.
Precondition:	The localization GPS/DB agent provides selected points coordinates and map web service provides physical condition type.
Postcondition:	-
Process Steps	

1	The path planning agent receives a request from the map web service agent to find a path.	
2	The path planning agent requests obstacles coordinates from the localization GPS/DB agent which are in calculated paths.	
3	The path planning agent receives obstacles coordinates from the localization GPS/DB agent.	
4	The path planning agent sends final path based on the actor's physical condition type data to the map web service agent.	

Exceptions		
4a	The system cannot find a path find between current location and destination.	Error message is generated stating that the path is banned, or there is no path between selected points. 1. Path is not accessible. 2. There is no path between selected points.

Relationship:	
Initiating	Map web service agent
Collaborating	Localization GPS/DB agent

Other diagrams:

Data requirements:	
Data Required:	current location coordinates - destination coordinates - physical condition type - obstacle coordinates

Class Diagram
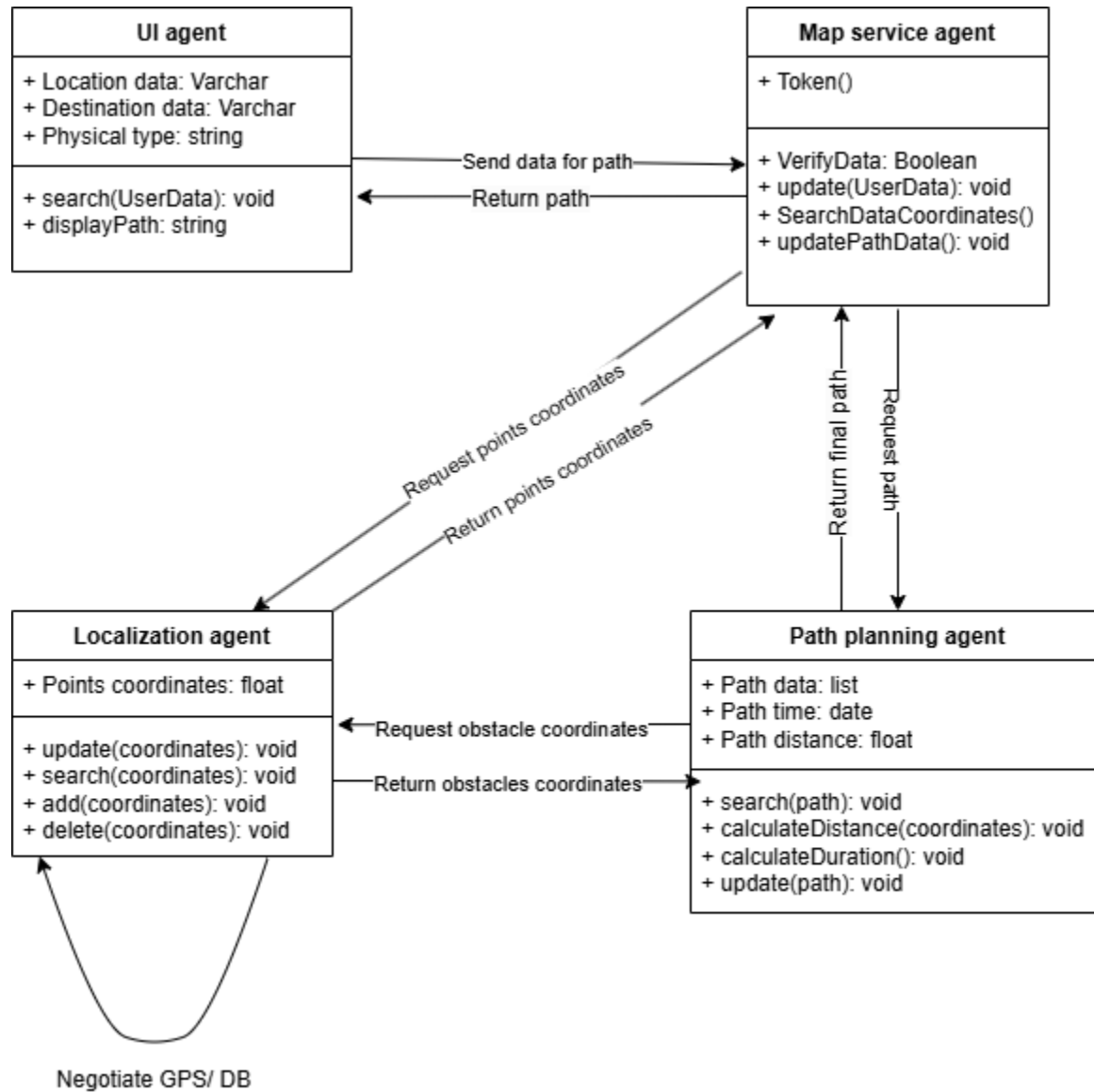
Data Specification

ER Diagram:
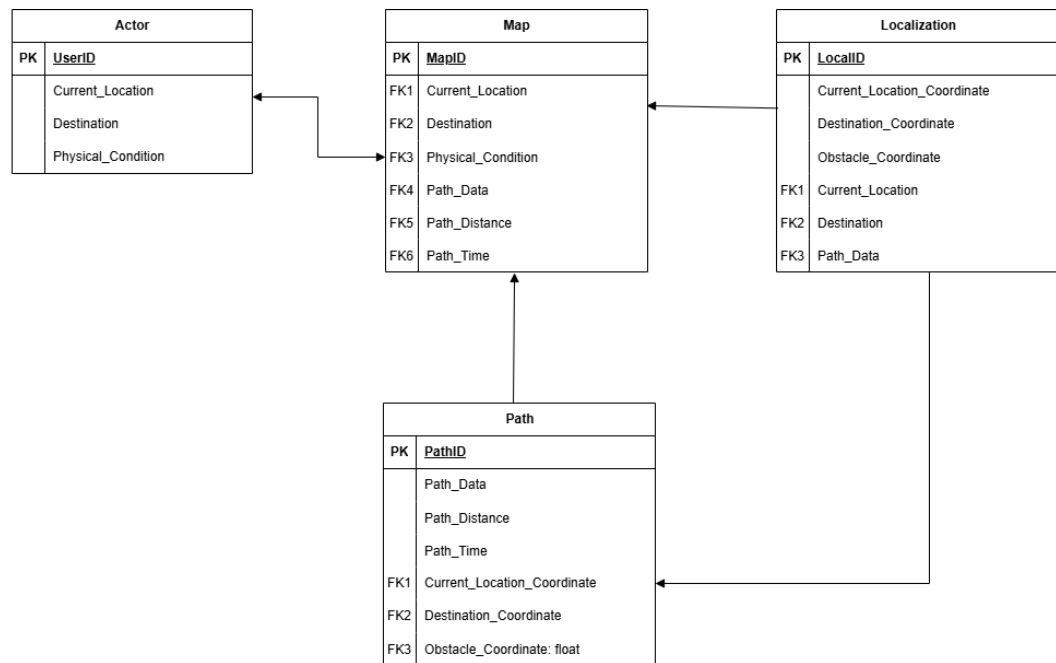
In this tables (PK) stands for primary kay and (FK) stands for foreign key.

Table Name	Attributes	Type	Description
Actor	UserID	Long	PK - Unique ID
	Current_Location	Varchar(50)	PK - Current location
	Destination	Varchar(50)	PK - Destination
	Physical_Condition	Varchar(50)	PK 1=with disability 2=without disability

Table Name	Attributes	Type	Description
Map	MapID	Long	PK - Unique ID
	Current_Location	Varchar(50)	FK
	Destination	Varchar(50)	FK
	Physical_Condition	Varchar(50)	FK

	Path_Data	Varchar(50)	FK
	Path_Time	Date	FK
	Path_distace	Float	FK
Localization	LocalID	Long	Unique ID
	Current_Location_Coordinate	Float	PK - Current location coordinate
	Destination_Coordinate	Float	PK - Destination coordinate
	Obstacle_Coordinate	Float	PK - Obstacle coordinate
	Current_Location	Varchar(50)	FK
	Destination	Varchar(50)	FK
	Path_Data	List	FK
Path	PathID	Long	PK - Unique ID
	Path_Data	List	PK - List of path details
	Path_Time	Date	PK - Path time to distance
	Path_distace	Float	PK - Path distance to distance
	Current_Location_Coordinate	Float	FK
	Destination_Coordinate	Float	FK
	Obstacle_Coordinate	Float	FK

Inter-Agents Messages

Inter-Agents messages input parameters between the actor and the map:

Parameter	Description

`<path>`
   `<userID>n</ userID>`
   `<currentLocation>String</ currentLocation >`
     `<destination>String</ destination>`
     `<physicalCondition>String</ physicalCondition>`
`</path>`
	User's path related information

Inter-Agents messages output parameters between the map and actor:

Parameter	Description

`<path>`
   `<mapID>n</ mapID>`
   `<currentLocation>String</ currentLocation >`
     `<destination>String</ destination>`
     `<physicalCondition>String</ physicalCondition>`
   `<pathTime>Date</pathTime>`
   `<pathDistane>float</ pathDistane>`
`</path>`
	User's path information

Inter-Agents messages output parameters between the map and localization:

Parameter	Description

`<location>`
   `<mapID>n</ mapID>`
   `<currentLocationdata>String</ currentLocationdata>`
     `<destinationdata>String</ destinationdata>`
`</ location >`
	Request for the selected points data

Inter-Agents messages output parameters between the localization and map:

Parameter	Description

`<obstacle>`
   `<locID>n</ locID>`
   `<currentLocationCoordinate>Float</currentLocationCoordinate>`
     `<destinationCoordinate>Float</ destinationCoordinate>`
`</obstacle>`
	The selected points coordinates

Inter-Agents messages output parameters between the path planning and localization:

Parameter	Description

`<location>`
    `<pathID>n</ pathID>`
    `<obstacleLocationCoordinate>Float</currentLocationCoordinate>`
    `<pathData>array</pathData>`
`</location>`
	The path data and request for obstacle's coordinates in path

Inter-Agents messages output parameters between the localization and path planning:

Parameter	Description

`<location>`
    `<mapID>n</ mapID>`
    `<currentLocationCoordinate>Float</currentLocationCoordinate>`
        `<destinationCoordinate>Float</ destinationCoordinate>`
`</location>`
	The obstacle's coordinates in path

Inter-Agents messages output parameters between the map and path planning:

Parameter	Description

`<path>`
    `<mapID>n</ mapID>`
    `<currentLocationCoordinate>Float</currentLocationCoordinate>`
        `<destinationCoordinate>Float</ destinationCoordinate>`
        `<physicalCondition>String</ physicalCondition>`
`</path>`
	Request for map with points data

Inter-Agents messages output parameters between the path planning and map:

Parameter	Description

`<path>`
    `<pathID>n</ pathID>`
    `<pathData>Array</pathData>`
        `<pathDistance>Float</pathDistance>`
        `<pathTime>Date</pathTime>`
`</path>`
	The path data