



INTER IIT TECH MEET 2021

HOSTED BY IIT GUWAHATI

ENGINEER'S CONCLAVE

INSTITUTION: IIT(BHU) Varanasi

GROUP MEMBERS:

S.No.	Team Member	Enrollment Number
1	Vaishnavi Tiwari	18045108
2	Nivesh Mittapally	18045145
3	Sampreet Devarakonda	18035012

PROJECT REPORT

Project Name: Augnex, AR Based On-campus navigation system

The problem addressed by the project:

To enable easy navigation for visitors during college fests by reducing the time taken to ask for directions and thereby improve their experience, Augnex(Location-based AR app) was built that uses real-world landmarks to display augmented directions to aid navigation in college premises during Technex, the techno-management fest of IIT Varanasi.

Proposed Solution:

Most of the visitors in IIT Varanasi face a lot of problems finding their destination whenever they visit our campus during the fests as they don't know the common terminology used by the locals for different buildings on the campus. So they had to rely on the students/locals for the direction to their destination. Here comes Augnex, an AR-based navigation system that reduces all the friction in this process by assisting navigation visually based on user geo-coordinates.

MOHNISH KUMAR
7562 982 547
OVERALL COORDINATOR

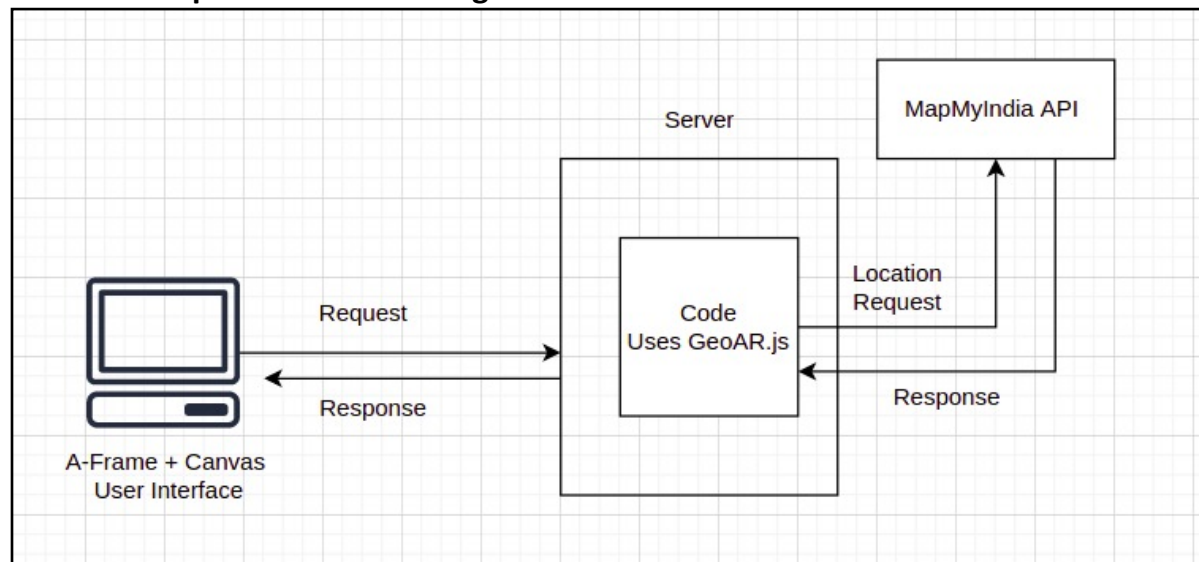
YOGESH YADAV
8187 982 354
OVERALL COORDINATOR

Augnex is a web-based application that guides users to their destination from their current location using Augmented Reality (AR). We used location-based AR for developing the application. The application has two main features.

1. The first being providing the path to destination with the help of 3D dots that appear on the screen on the basis of geo-coordinates of the user (refer Fig 2).
2. Secondly, a 3D cube is displayed on each crossroad showing which road leads to which location(refer Fig 3).

The application was developed with the intent to help external participants of our Annual Techno-Management fest Technex'20. It helps first-time visitors to seamlessly navigate and explore our university campus. This is a canonical issue as most of them find it difficult to reach their destination as building-level navigation through Google Maps is highly inaccurate and the generated directions are inadequate and unintuitive.

Technical Implementation of Augnex:



We have used the GeoAR.js library for the AR part of the project. GeoAR.js is an open-source library in Github. GeoAR.js uses A-Frame for displaying the augmented content. A-Frame has an entity named GPS-entity-place which displays the model on specifying longitude and latitude values. Which can be added with a script or loading them from APIs (Foursquare, Google Maps, MapMyIndia, and so on) or just adding them statically on your HTML. The main logic of the application is to constantly check the current location of the user and render the 3D model if the user is inside the boundaries



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where the model has to be rendered.

We have used the MapMyIndia API for getting the current location of the user and also to check whether the user is within the provided boundaries. The 3D models that have to be rendered were created using the blender, and they were exported in the form of .gltf for usage in the application. On providing the destination by the user a shorted path from the current location to the destination will be obtained from the MapMyIndia API and then using these path locations the dots were augmented on the path which will lead the user to the destination.

Test Results:

1. The application has successfully rendered all the models accurately at their respective locations.
2. The application has received around 3000 requests in the span of 5 days.
3. The application was built for IIT BHU which covers approximately 500 acres of the area spanning varied landscapes and building arrangements. The proposed solution is empirically found to be robust with mediocre computational demands.
4. The accuracy of the application depends on the GPS accuracy (± 10 meters in general) of the device as it uses the GPS to find its current location.
5. It is compatible with any device which has a browser that supports WebGL and webRTC such as all the versions of chrome and firefox released after 2015.
6. Since the application does not have any database connectivity the response time is faster.
7. The application is a pure web solution so no additional installation is required.



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Fig 1

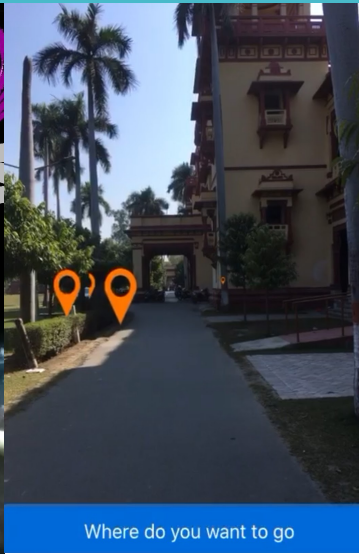


Fig 2

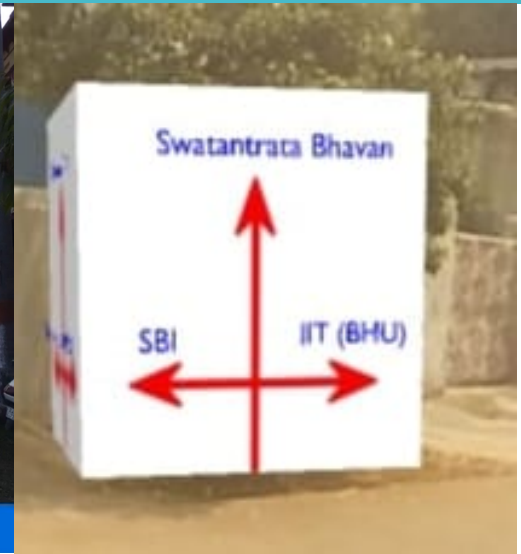


Fig 3

Prototype:

Refer to the working prototype here-

<https://drive.google.com/file/d/1BRGYyfPOD88yyiGGNBZ9-TkepcxjNpjW/view?usp=sharing>.

Survey:

1. We have seen many visitors in the IIT BHU face issues while reaching their destination, which incurs them a lot of time and effort. At first, we came up with a solution of using posters at each turning point which could help them to reach their destination easily. This approach had some drawbacks such as they might not notice the poster, spoilage of posters due to climatic problems, and obviously extra labor for setting them up. So we tried to propose a technical solution for the same and came up with an Augmented Reality-based solution Augnex which helps the user to reach their destination easily.
2. As far as we know Niantic and Nintendo launched Pokemon Go - the hugely popular location-based AR game that put AR on the mainstream map. From there on, Google has used the idea of location-based AR by integrating with Google



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maps to increase user experience tremendously. Augnex started out with the same motivation.

GitHub Documentation:

<https://github.com/iitiansd/AR-Institute-GEO-Location>

References:

1. AR.js documentation: <https://ar-js-org.github.io/AR.js-Docs/>
2. GeoAr.js GitHub Repository- <https://github.com/nicolocarpignoli/GeoAR.js>
3. <https://medium.com/chialab-open-source/location-based-gps-augmented-reality-on-the-web-7a540c515b3c>