

Project Proposal -- TEAM 7

Team No. 7

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Project Name: WeMeet3D

Project Synopsis

Virtual 3D meeting space that allows users to move around, customize their virtual avatars, and connect with others via audio, video, and text chat.

Project Description

In light of the social distancing regulations imposed due to Covid-19, we are creating an online communication application with a 3D virtual environment. Most online meeting / video conferencing software currently on the market have very little interactivity, and it is common for users to feel more and more fatigued and disengaged with video conferencing over time. We want to help users feel more connected to the people they are meeting by making the meetings more interactive while still incorporating audio and video features. Users can use their virtual avatars to walk and look around within a virtual space, and walk up to other users to engage in audio and video chat.

To design the project, we are planning to primarily use Unity, as well as any other APIs necessary to create an engaging virtual 3D space.

The end result of the project is that the users of the application will be able to meet and talk with other participants through audio and video in a 3D virtual environment and get the feel of actually being present in the room.

Project Milestones (for both semesters):

Task number	Start Date	End Date	Milestone
1.1	2020-09-24	2020-10-04	create milestones
1.2	2020-10-04	2020-10-17	create use diagrams
1.3	2020-10-18	2020-10-21	design project specification
1.4	2020-10-03	2020-10-25	research APIs/tools
1.5	2020-10-08	2020-10-10	make Gantt chart (through the spring semester)
1.6	2020-10-11	2020-11-01	complete project proposal report and video
1.7	2020-11-02	2020-11-02	Github setup/ Installation
2.1	2020-10-27	2020-11-15	create the 3D meeting space and the first room preset
2.2	2020-10-27	2020-11-15	put user character into 3D meeting space; user can move and look around
2.3	2020-11-09	2021-02-06	UI: welcome screen, main menu, room creation menu, and join room menu
2.4	2020-11-23	2021-02-11	put 2 user characters into 3D meeting space (online multiplayer); host the 3D meeting space on a server
2.5	2020-11-03	2021-01-30	implement audio/video calls for 2 participants
2.6	2021-01-03	2021-02-21	implement text chat for 2 participants
2.7	2021-02-11	2021-02-15	final project design document

2.8	2021-02-12	2021-03-07	create website to host the app
2.9	2021-02-13	2021-04-18	Generate room code and password for meeting access
2.10	2021-02-13	2021-04-04	create preset meeting rooms including wall/floor appearance and objects in the room
2.11	2021-02-22	2021-04-18	implement basic character customization, including UI menu
3.1	2021-04-19	2021-04-26	create final project video
3.2	2021-04-27	2021-05-03	Final Quad Chart

Gantt Chart [attached as last page]

Project Budget

Our team did a lot of research trying to find assets that are free and/or open source. We can host our project for free in Unity if we use a Host-Server approach. We can also host the website for our app on Github Pages for free. Besides that, we are being really careful in only using assets that are free (like characters or APIs). One thing that we may need to pay for is additional storage and bandwidth in Git LFS (Large File Storage), since our Unity-based project necessarily has relatively large files; we estimate at most we would need to spend \$5-\$15 for this service.

Overall, our budget for this project should be \$15.

Final Project Design

How the software works:

The software is designed to enable interactivity with users within a 3D virtual environment. The software will be available as a web based application to enable anyone to access it without having to download anything. Users who use this platform are able to host or participate in meetings. The host can create a meeting room, selecting from a few preset spaces (such as a forest clearing, a conference room, the surface of the moon, and so on.). Once the room has been created, a randomized room code will be generated as an identifier for the room. For further validation, the host has the option of either using a randomly-generated password or making a custom one. The host can then share the room code and password with any participant users. The participants can enter the meeting room by entering the room code and password provided by the host.

Before creating or joining a meeting, users can customize their avatars in the customization menu; the character customization options will be fairly limited for now as we're planning to incorporate free existing characters into our app. Once users have entered the 3D meeting space, they can then use their avatars to freely walk and look around. Users can choose to activate their audio and video and talk to any other users in the meeting space. Users can also use text chat to talk to other users in the meeting space. The user is free to leave the meeting whenever they choose to. Otherwise, all of the users will be logged out automatically as soon as the host ends the meeting. Once users leave a meeting, they will return to the main menu where they can choose to either create or join other meetings or choose their avatars.

Figure 1 shows an illustration of the user view in one of the rooms that we will have available for meetings. Some other rooms that we are planning to include are a conference room and the surface of the moon.



Figure 1: User view within the Forest meeting room.

WeMeet3D

*Enjoy meeting in an engaging
and interactive environment!*

ENTER

Figure 2: User view of the welcome screen.

WeMeet3D

**JOIN
A MEETING**

**CREATE
A MEETING**

CUSTOMIZE YOUR AVATAR

Figure 3: User view of the main menu.

WeMeet3D

JOIN A MEETING

Enter room code:

Enter password:

show
password

ENTER MEETING

**RETURN TO
MAIN MENU**

Figure 4: User view of the Join Meeting menu.

WeMeet3D

CREATE A MEETING

Choose a meeting room:



Forest



Conference
Room



Moon

Room code:

copy to
clipboard

randomize

Set a password:

randomize

show
password

ENTER MEETING

**RETURN TO
MAIN MENU**

Figure 5: User view of the Create Meeting menu.

WeMeet3D

CUSTOMIZE YOUR AVATAR



RETURN TO MAIN MENU

Figure 6: User view of the Customize Avatar menu (still in progress).

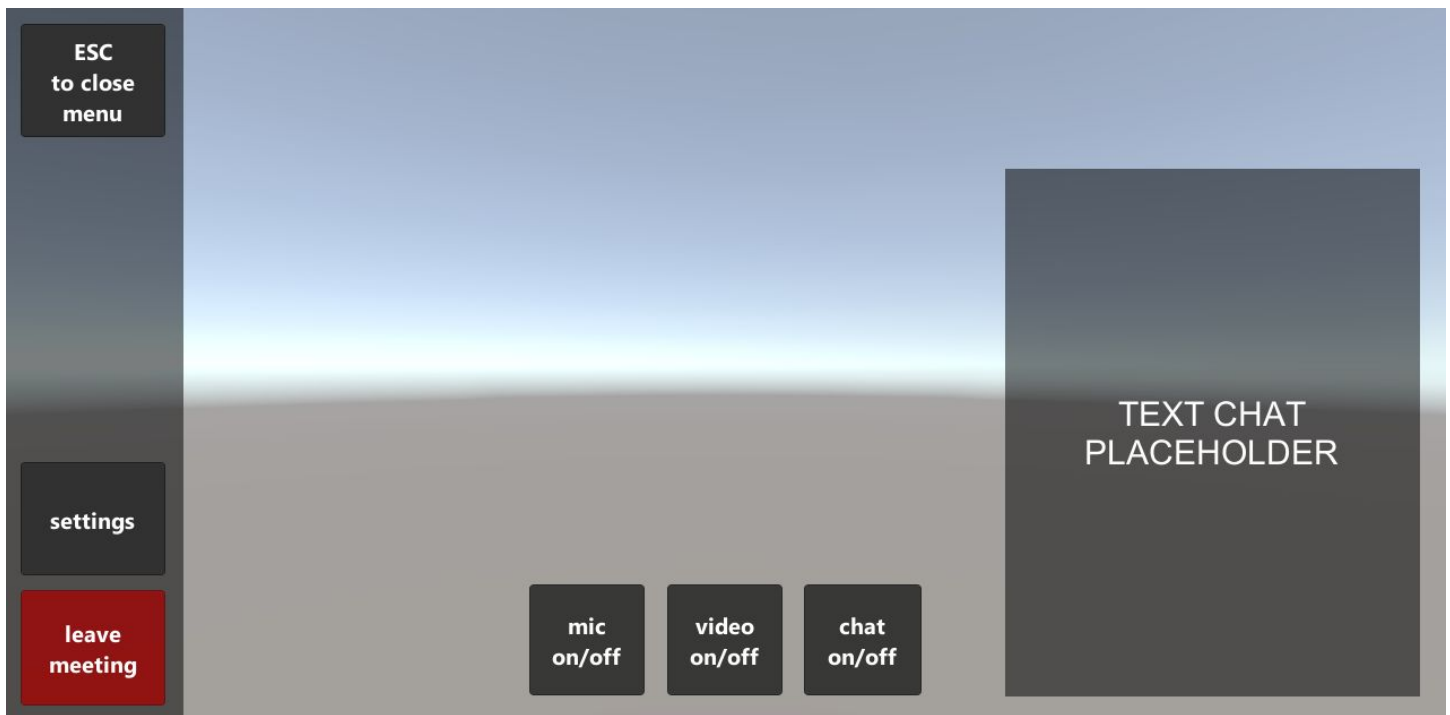


Figure 7: User view of the Pause Menu.

Figures 2 - 7 show the user menus. The Welcome Menu consists of a welcome message and a button to enter the main menu as shown in Figure 2. On the next page, the Main Menu, the user has the choice of joining a meeting, creating a meeting, or customizing the avatar as shown in Figure 3. If the user chooses to join an existing meeting, the user can enter the room code and the password to enter the meeting room as shown in Figure 4. If the user chooses to create a meeting, the user is led to the room creation menu where they can select from a list of available pre-set meeting rooms, as shown in Figure 5. Then a unique code is generated that can be copied to the clipboard where it can be shared to other participating users. A password can also be chosen for authentication. Once the host enters the credentials required for the meeting, they can enter the meeting room. If the user chooses to customize the avatar, they will be led to the page as shown in Figure 6 where the user can select from a list of premade avatars. The avatar customization functionality, including the interface, are planned to be implemented later on. While a user is in a meeting, they can “pause” and view their Pause Menu, as shown in Figure 7. The Pause Menu is translucent and has buttons that allow turning the microphone, camera, and text chat overlay on and off (these functionalities are in progress).

Design Constraints

Technical Constraints: As a team, we decided to focus on only implementing our project as a web-application. This constraint will make it easier for us to focus on implementing our software with a specific objective in mind instead of trying to accomplish too much in a short period of time. Since we are also using Unity as the primary engine for our software, we are limited to the functionality that Unity (and associated APIs) are capable of, such as the assets offered. We also need to be careful about the number of participants allowed to join the meeting. We plan to implement our project as a web-application. In addition, we also plan to provide video and audio calling functionality to the users. To account for these additional features and constraints we will be limited to the number of participants allowed to join the ongoing meeting. We also had issues integrating Unity with Git and issues related to limited storage and bandwidth in Git LFS which we are planning to resolve by including additional storage and bandwidth in our budget.

Business Constraints: Initially, we decided to limit the budget to 0 dollars since we did not want to spend any of our money on this project. However, we have now decided to allocate a small budget for purchasing additional storage and budget (as seen on the budget section). Since we didn't allocate any budget for any other

resources, we have a lot of limitations in the software or assets that we can add to the project for free. The same applies to our video proposal -- we had to find creative ways of incorporating free videos, images, and a logo.

Other Constraints: Due to our current situation during the pandemic, there are other constraints that have to be taken into factor. For instance, since we are not able to meet up with each other in a physical space, we are not able to collaborate in person as a team and we do not have the ability to check up on each other's progress or help each other solve technical challenges the same way we would have been able to if we were having team meetings in person. Also, some of us have other constraints related to slow or unreliable internet connections, etc.

Attached are our Use Case and State Diagrams:

Figure 8 shows a state diagram. It describes the behaviour of a single object in response to a series of events in the system. State diagrams are important to model the behaviour of the system as a whole. We include a finite number of states, and indicate the start and end state in the diagram. In this case, the start state is when the user decides to start or join a meeting and the end state is when the user decides to end or leave a meeting.

Figure 9 shows a use case diagram. It is a representation of the user's interaction with the system that shows the relationship between the user and the different use cases in which the user is involved. In our diagram, the host is the person that created the meeting. We indicate all other users who join the meeting as participants in the use case diagram.

WeMeet3D State Diagram

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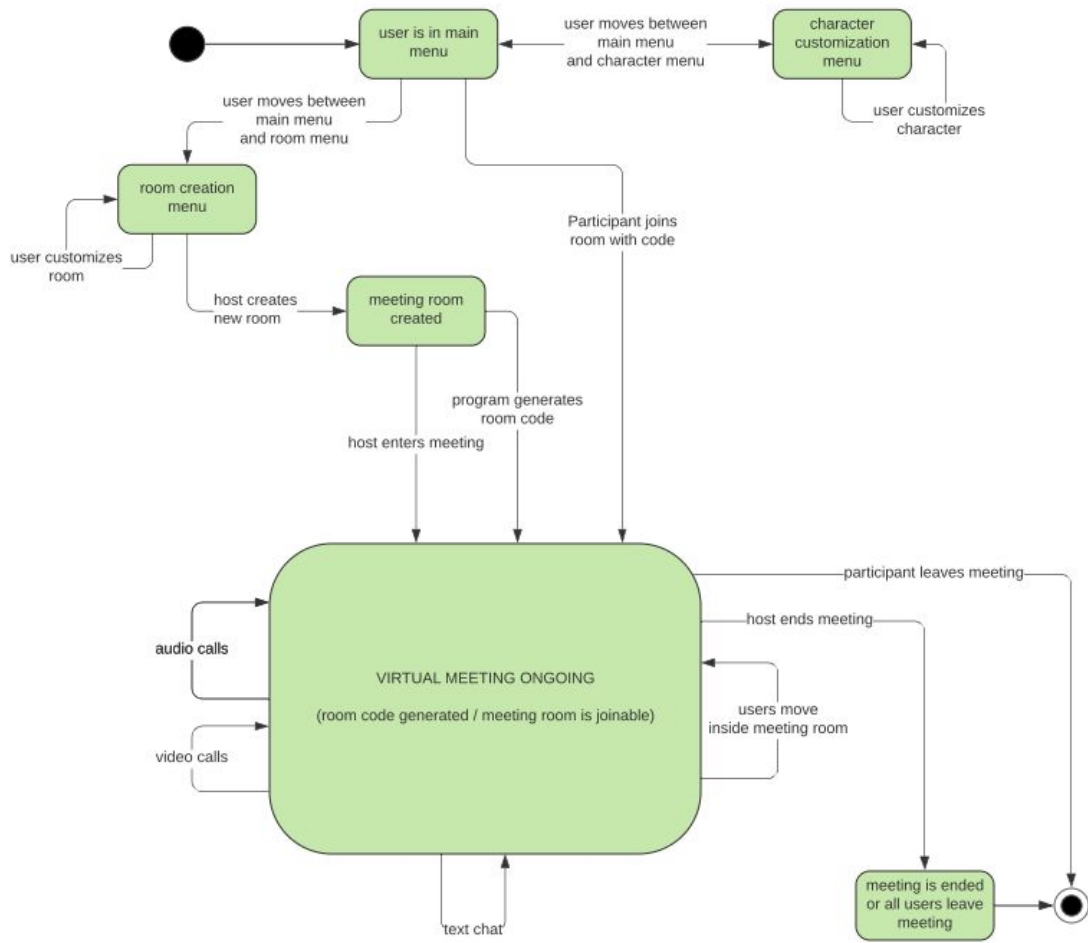


Figure 8: State Diagram for WeMeet3D

EECS581: Use case diagram

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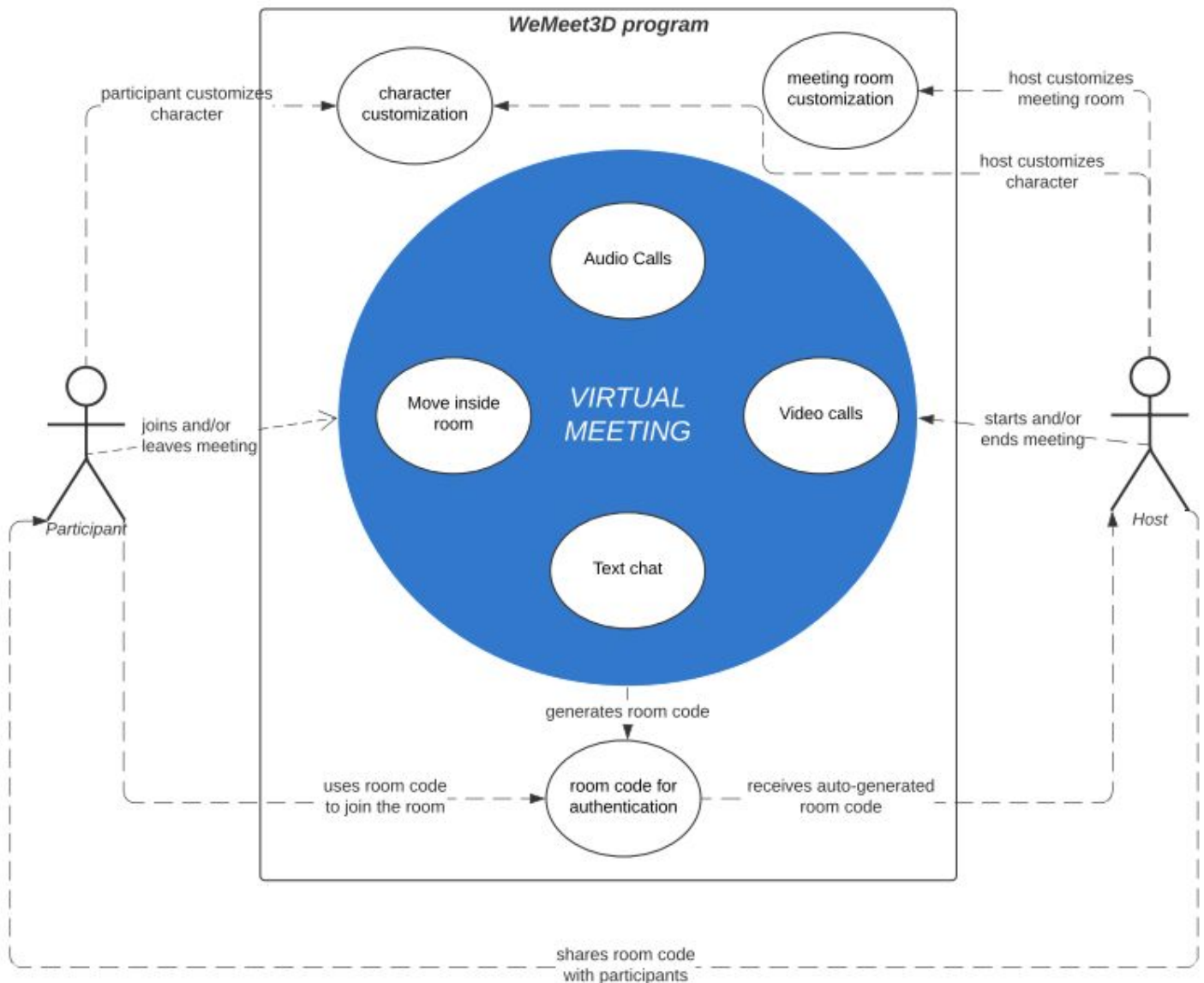


Figure 9: Use Case Diagram for WeMeet3D

Ethical Issues

1.5 Respect the work required to produce new ideas, inventions, creative works, and computing artifacts.

An ethical issue we must take into consideration is to make sure to credit the work of the creators. When importing different API's, we must make sure that these API's are imported from Unity specifically as assets. These assets imported should be free and open source software. By using the assets imported from Unity we can produce new ideas while still giving credit to the creators. It is important to use API's from Unity because if we use API's outside of unity, we could end up potentially using software that is not patented and copyrighted. This would end up claiming private ownership to work not belonging to ourselves.

1.6 Respect Privacy

One of the ethical issues that we'd potentially encounter is that we might violate the privacy of the users who are using the app. Since the only authentication that we're planning to use is a link to access the meeting, we may leave our app vulnerable to hackers as the link could easily be shared and could potentially result in hazardous consequences for the users' privacy. To combat the worst-case scenarios mentioned above in order to respect the privacy of the users of our app, we are working to ensure that we're focusing our resources not only on building the functionality of the app, but on enhancing the security of our platform. We are also working on developing a more rigorous authentication for the app to ensure that the link couldn't be shared with anyone by implementing passwords.

3.1 Ensure that the public good is the central concern during all professional computing work.

Although our intention for the app is that it should entirely be used for educational, professional or respectful social causes, it is incredibly easy to misuse a platform like WeMeet3D to host events for less than noble causes. For instance, WeMeet3D could potentially be a platform to spread hate, bias and violence. Even though how a user chooses to use our app is beyond our control, we will definitely work towards building a platform that does not in any way tolerate hatred or discrimination to any of our users. This could be in the form of adding functionalities like banning certain people from using the app, implementing report or block functionalities, for instance.

Intellectual Property Issues

There are a few platforms such as Zoom and Gather that have a model similar to our project - WeMeet3D. They are used for video and audio conferencing and provide an online chat feature as well. Both the platforms generate random codes for the respective meeting rooms, similar to what we plan to implement. However, through WeMeet3D we plan to implement a more interactive and engaging meeting session. We plan to make users feel more connected to the people they are meeting with. Users will be able to use their virtual avatar to move around in the room and engage with other participants through audio and video calling features.

It is also important for us to consider copyright infringement when we develop our project. Copyrights provide the owner of the original work five rights - reproduction, distribution, public display, public performance, and production of derivative works. Software is protected by the copyright laws. If we use code or features developed by someone else, we must pay attention to whether we are violating any copyright laws. We must also take measures to give the work of the original creators credit. In addition, the Fair Use concept mentions that it is sometimes legal to reproduce a copyrighted work without permission. If possible, under this Fair Use concept, our team could use parts of code that would benefit the overall project.

Change Log

- Changed the project description for clarity and to remove a sentence about displaying users' video feeds on their avatars, as we think that will no longer be feasible to implement.
- Updated figures to show current app images; updated descriptions for these images.
- Updated the milestones and Gantt chart to reflect new milestones and deadlines.
- Updated the Project Budget, to include potential costs for Github Pages and Git LFS.
- Updated the ethics portion to reflect current changes.
- Updated the design constraints to reflect changes on budget and technical issues encountered.

