New possible applications of the augmented-reality in urban design

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Abstract. Nowadays, the augmented-reality, usually called as AR, means the overlay of virtual item with a really existing scene. It has been widely used in some areas, like movie industry and design. As for architects, some will use it in the process of design. Instead, the augmented-reality can also be used in urban planning and design. For example, the augmented-reality can overlap the information of the stores with the real situation, and people can easily find the place they need to go to. Also, the augmented-reality can also be used to help the developers to collect the information from people, and obtain people’s demand for urban development.

1. Introduction
Based on the quick development of the augmented-reality and geoweb technology, the architects and planners can use apply these techniques into their research and daily work. Different from the common applications of the augmented-reality, some new applications of the techniques are proposed during our research on the augmented-reality. For example, there can be some mobile applications to help people find the stores they want to go to, and also can collect the information of their demand. Then, all the information can be collected to help planners make decisions in urban design.

2. Basic concept of the augmented-reality and its usual application
In general, the augmented-reality can be regarded as a real time view of the real world which has been overlapped with the virtual information, like some virtual items. Meanwhile, augmented-reality can also be regarded as a bridge to connect the real world and the virtual world[1]. In fact, the augmented-reality also enhances people’s intersection with the real world just around them. There are quantities of the applications related to people’s life.

Figure 1. Use the virtual furniture to check the design.
For example, AR can be used to help check the exact position and scale of the furniture in the room, just like Figure 1. Here, the designers can easily use IKEA virtual furniture to check whether their design is good enough and how to modify it to make it better[2]. This is just one of the common applications people will usually see in daily life. At the same time, most people have ever played a game called Pokemon Go, which is also related to the augmented-reality technique. Also, some engineers will use AR to help explore the existing pipes and systems which are behind the walls. These are most common applications of AR in our daily life[3].

3. New possible applications

Here are mainly two kinds of the new possible applications of the augmented-reality in urban design. The first one is related to the collection of people’s demand for urban design, and the second one is about guiding people to their destinations.

3.1 Collection of people’s demand for urban design

Nowadays, mobile phones gradually become one of the most important part of people’s daily life, and this also means, people will spend a lot of time playing with their mobile phones. It is not that difficult to image that, in the city, people will take with the phones everywhere. And then, when they feel uncomfortable with some of the infrastructures, they may complain about it through some apps, like Ins and Facebook. So why not directly ask them to modify what they do not like?

As is shown in Figure 2, in the city, when people feel uncomfortable with some facilities, they can directly open the app in their mobile phone and try to replace them with the virtual facilities. Next, all the modifications people have made will be collected by the system, and then will be sent to the planners of the city. In this way, the planners can easily know what people need exactly.

![Figure 2. The process of the AR system. It can be used to collect the information to help adjust the urban planning.](image)

Here is an example which is related to the new application. As is shown in Figure 3, Game of deletion, a project from Southern California Institute of Architecture in Los Angeles, is an augmented-reality game related to the field of architecture[4]. Considering that there will be lots of murals in the city of Los Angeles, the designers of the game just use these murals as the augmented-reality markers. Through detecting these markers, the users will see the virtual objects on the murals, and they can play with the murals. In the game, the wall with murals are divided into several parts. People can delete several parts, and reorganize them. In this way, people can obtain the murals they want. Also, there can be some gaps in the walls, through which people are able to see the buildings behind.
Figure 3. The virtual mural after people’s modification with AR. And there is a gap, through which people can see the buildings behind[4].

If the designers of the project go further, all the information can be collected through the app in the mobile phone. This will definitely contribute to the urban planning of Los Angeles.

3.2 Virtual billboards and signs
In the city, there are quantities of high buildings and lots of them look similarly. When people are moving in the city, sometimes, they may feel confused. Especially when their destination is in a high building, people cannot easily find the destination with the help of Google Map[5]. One day, if people can directly know the specific functions of each floor and every store, people can quickly find where they should go.

Figure 4. The virtual information of each floor shown outside, and people can directly see it on the street[6].

As is shown in Figure 4, in the city, when people walk on the street, they can directly know the specific information of each floor of the buildings through AR technique. Here, the AR information is directly overlapped with real-world situation. Then, people will go to their destination following the information provided by AR techniques. In a word, this application is relatively similar to the
navigation software like Google Map, but it can work quite well when people is close to their destination.

In the meantime, this application can also be used as virtual billboards. As is shown in Figure 5, all the information about the stores in the building can be seen by people in the street through augmented-reality technique.

![Figure 5. The virtual billboards shown through augmented-reality technique. People can see them through specific mobile phone app[6].](image)

Next, there is another advantage of the application. These virtual billboards will also need something like the augmented-reality markers. People can color the skin of architecture in an orderly manner, and this layer of color will be used as the augmented-reality markers, just like Figure 5 and 6. In this way, the lighting of the buildings will not be affected, and the elevations of architectures in the city will become more interesting and diversified.

![Figure 6. Pixel the color block on the window, and this can be used as the marker, and will not influence the lighting.](image)

Finally, in daily life, people need to combine the augmented-reality technique with navigation software. If people want to drive from home to a hotel in Hangzhou, they can use navigation software on the way from home to Hangzhou. When people are close to the hotel, they will use AR technique to check the specific position of the hotel.

### 4. Conclusion

Usually, the augmented-reality is used to assist people’s design. Differently, people can use these two new possible applications to participate in urban design and provide their own suggestions for the
planners. Meanwhile, combined with navigation software, the second application of AR can help improve the efficiency. In the future, with the development of AR technique, maybe everyone in the city can participate in the development of city. Besides, these two applications can also add a different landscape to the city.

Acknowledgment
I would like to express my gratitude to those who provide me assistance during the research. I acknowledge the help from my professor, Greg Lynn, and my instructors, Marta Nowak and Kaiho Yu, who provide me with some suggestions!

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