Interactivity is mentioned in many fields (architecture, industrial design, media art, computer programming, stage installation), which is also supported increasingly by the development of fundamental technologies (wireless charging, sensor development, augmented reality, artificial intelligence, smart phone popularization). According to Zeynep Gündüz’s research in interactive stage performances, "In relation to my own focus, it is important to be aware that there are at least three different types of digital dance practice created with real-time interactive technology, operating with real-time motion-tracking software, which I suggest it is possible to categorize as: 1) choreographic installations; 2) mixed practices, which combine elements of staged digital dance and choreographic installations; 3) staged digital dance."[1] The wide application of interactive technology will not merely let human have much deeper communication with machines but also has possibility to change the mode of human life.

In the field of architecture, the interactivity is generally considered as this definition, "Interactive Architecture explores the possibilities for dynamic, interactive spaces in which people and buildings engage in a mutual relationship with one other. By connecting the data, stories and experiences that develop though this relationship between buildings and their inhabitants, the built environment becomes an interactive, adaptive and animate entity."[2] It talks more about the relationship between people and the building. But architecture is not only about space, it is also about the building ecology, about sustainability. So what will the role of interactive systems be in the sustainable architecture?

"Sustainable architecture seeks to minimize the negative environmental impact of buildings by efficiency and moderation in the use of materials, energy, and development space. Sustainable architecture uses a conscious approach to energy and ecological conservation in the design of the built environment."[3] It is often considered as sustainable energy use (heating& cooling system, ventilation), renewable energy generation( solar panels, wind turbines, heat pumps) as well as using sustainable building materials. After introducing the concept and also technology of interactive into sustainable architecture, the new kind of opportunities will appear in environment friendly building climate control and energy consumption. In my opinion, the opportunities exist both in global and local aspects.

From the local perspective
The development of architecture interactive components have been increased significantly in recent years. With the growing of fundamental interactive technology, the interactive architecture components has great potential in dealing with the environment friendly building climatic issues and the integration with architecture design. One famed case that use the interactive components is the Institute du Monde Arabe designed by Jean Novel. The window components are interactive with the sunlight and controlling the indoor climate, as well as present the typical Arab pattern. Typical of Jean Nouvel’s work is his attention to façade detailing, and this design is no exception. A main feature and innovative element of the IMA is the advanced responsive metallic brise soleil on the south façade. Nouvel’s proposal for this system was well received for its originality and its reinforcement of an archetypal element of Arabic architecture – the mashrabiyya. He drew inspiration from the traditional lattice work that has been used for centuries in the Middle East to protect the occupants from the sun and provide
privacy. The system incorporates several hundred light sensitive diaphragms that regulate the amount of light that is allowed to enter the building. During the various phases of the lens, a shifting geometric pattern is formed and showcased as both light and void. Squares, circles, and octagonal shapes are produced in a fluid motion as light is modulated in parallel. Interior spaces are dramatically modified, along with the exterior appearance. While these ocular devices create an incredible aesthetic, they are functional from an environmental controls standpoint as well. Solar gain is easily mitigated by closing or reducing the aperture sizes.[4] The progressive integration of networked, interactive devices into the physical environment is implying a transformation not only in the operation and use of built environments but also a change in their physical configuration, and therefore, their design.[5] This case shows an effective way of using interactive components which utilitarian functions integrated with architectural aesthetics.

From the global perspective
In the 1:1 prototype workshop of hyperbody, it had shown that interactive and non-standard system has a great potential in new mode of spatial occupation and environment friendly climate ecology as well as energy consumption. In the project of cloud life of our team, we explored the most efficient use of space and how it effects in environmental aspects.

The basic idea of this project is we attempt to transform the mode of usage of work space. The usage time of most office space is mainly in the daytime, and idle in the night. So we imagine if it is possible to make a kind of space which can be used continuously for twenty four hours, overlapping the working and living spaces, in order to increase the efficiency of the building by twice the usage time. On the other hand, people have different spatial demands for different function needs, but only one space can be used for one person at a time, and the rest spaces are idled. Based on these two aspects, we developed an interactive ceiling system, each facility is set as one component, stored on the ceiling, can be moved and lifted to any position and any height in the space. So when people have different functional demands, by changing the functions and properties of one space to meet it, rather than changing the space. It can meet variety demands of different people when the functional diversity reaching a certain level, thereby to increase the space efficiency. One step further, we developed an interactive control system. People can customize the space with different settings and arrangements by logging in personal data. Different people can find personal sense of home belonging in the same space by this interactive control system. With this two interactive systems, one based on physical transforming the other based on data steam, the efficiency of space usage will enhance, hence the energy consumption will decline and thereby to influence the global environment. This project is not just a interactive installation or a responsive façade, the interactive system of this project lies in the physical installation and the functional demands of human as well as the spatial usage. This kind of interactive architecture will change the mode of human life in a certain extent and thus effect the energy consumption and the climate issues.

In my graduation project, we want to explore a new type of urban pattern which is generated and emerged by the simulation of interaction between the buildings, in order to seek a bottom up generative method to increase the efficiency of urban connectivity and decrease the consumption of transport cost. The site of my project is in the Marconiplein which is a junction with many roads come together and mixed with three stations. The plaza is located at the central
of the north boundary of the Nieuw Mathenesse, which is an industrial area that need to be transformed to a residential and small office district. With this changing of the old port area, the population will meet a dramatic increasing, thus the transport infrastructure need to be update in a priority. In the opposite side of Marconiplein of the Nieuw Mathenesse, a project of ferry hub is developing by another hyperbody student. We work individually in our own building project, but we want to explore the possibility of generate an interactive urban pattern which is triggered by the two buildings of transport infrastructure. With the interaction between our two large scale buildings, we want to seek that what kind of urban typology will be generated and emerged, in order to seek a bottom up generative method to increase the efficiency of urban connectivity and decrease the consumption of energy, thereby to influence the environmental issue. And further to research in what extent can the digital architecture impact the mode of city life. We will program certain amount of functions and each function with certain area by the data we get from the urban informatics. Pack these functions into the blank urban site by the agents system we developed. In this system, functions manifest as circle agents with different scales depending on their areas. There is attraction force between some agents, for instance, commercial agents are attracted by residential agents. But at the same time, there is also separation force between agents, such as commercial agents are separated by each other. Different agents have various strength of attraction or separation force. Based on this urban functional packing, the basic urban network can be generated. Urban transport simulation will take place on this urban network. By using the ant algorithm simulation, agents comes from the existing urban area into the architecture site, forming the basic architecture topology. Then the agents will pass through the urban network in attracting by the opposite building. Simultaneously, each segment of the urban network will calculate the amount of agents who pass through it. Depend on this data to define the hierarchy of the urban roads. With this bottom up digital method, the urban pattern is generated by the interactivity of the two transport hubs, in order to increase connectivity, effectivity, rationality and decrease the consumptions in energy and transport cost. It will introduce a new relationship between architecture and urban planning, therefore to have new opportunities in energy consumption, environment protection, social operation as well as city life.

Bibliography