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# [kitCHUN]

## Executive summary

Dementia is considered to be the fastest-growing major disease in China. Currently, there are more than 9 million diagnosed cases. Forecasts show that, by 2050, this number is expected to surpass 40 million patients. Moreover, the increase in the life expectancy of the Chinese from 40.8 years in 1955 to 75 years in 2013 and its predicted amelioration in the near future has shed the light on this issue.

People with dementia (PwD) suffer from a decline in mental ability which can ultimately interfere with daily life. This will eventually result in the loss of autonomy in the person's life and the need for a caretaker or/and support system becomes inevitable. This also means extra costs and pressure on the families of PwD.

The kitchen, being one of the most dangerous places in the house, can be off-limits for PwD. The project [kitCHUN] deals with providing PwD and the elderly with smart kitchen products that can improve their autonomy, increase safety, and provide their families with assistance and peace-of-mind while taking into consideration the cultural aspect of the Chinese society.

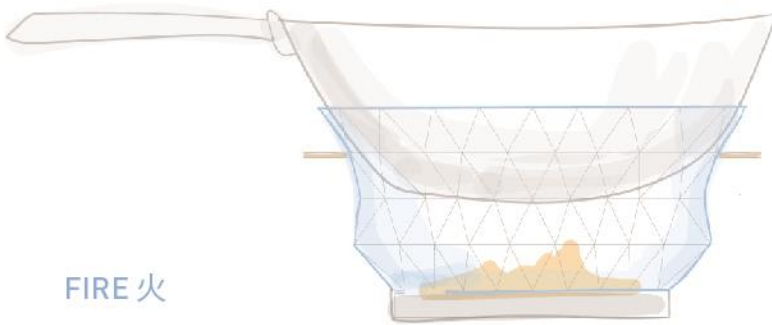
The developed products are collectively part of the *Balanced Living Integrated System for Seniors*, or *Bliss* for short. The kit can be distinguished into the basic version and the Help upgrade. The basic kit includes: a transparent pot holder called Fire which prevents the person from being in direct contact with the flame; an easy storage system called Box which provides flexible and modular storage spaces; a device named Lotus, which is an air quality monitor that alerts the family in critical conditions; a DIY module that allows to control humidity called Drop. The Help upgrade consists of an anxiety detection camera, a set of LEDs that recreate a peaceful lighting and atmosphere (Drop+) and a system that implements Smell&Sound therapy (Lotus+).

## Key Words

dementia, elderly, kitchen, China, Alzheimer's

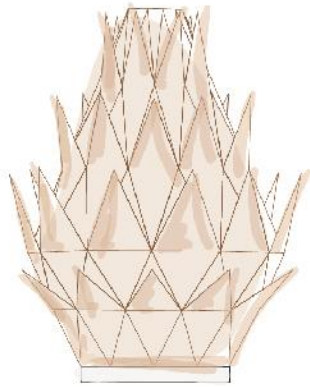


[kitCHUN] Bliss system representation in a traditional Chinese kitchen



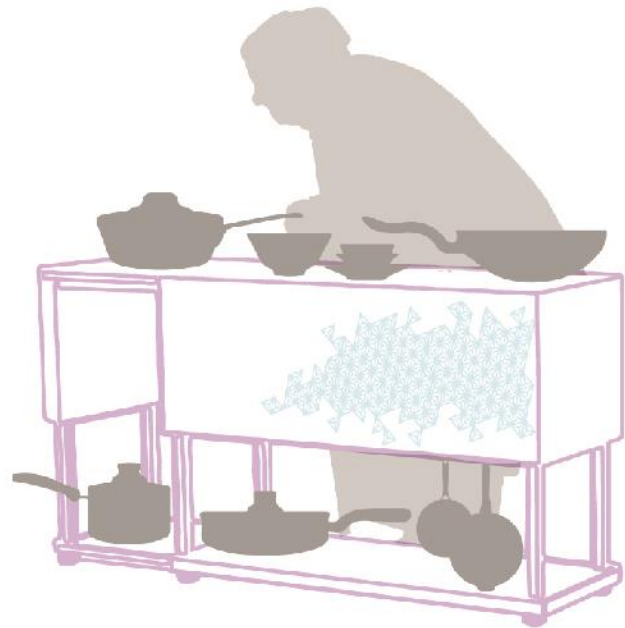
**FIRE 火**

Safety device  
Pyrex and heat resistant silicone  
Transparent in order to see the fire



**LOTUS 蓮花**

Air quality sensor system  
Aesthetically coordinated  
Connection to a caregiver  
Bamboo



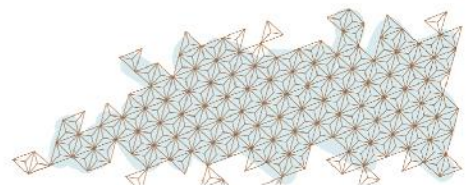
**BOX 箱**

Easy storage  
Wheels and brake system  
Configure your own space  
Bamboo



**DROP 降**

Humidity system  
DIY zhezhi module to cover the kitchen walls  
Customizable decoration  
Bamboo or Tyvek 4



**Project description  
written by the  
Principal Academic  
Tutor**

In this project, the design of the new intelligent kitchen home for aging society will be carried out to adapt to the characteristics of the new type of home-care for the elderly people in China and in Italy. We will face the daily needs of using kitchen for those older people who live alone or with form of disease, even brain disease (as Alzheimer). The target product should be intelligent, remotely assisted and based on the Internet, with the effective improvement on the structure and man-machine operation experience.

The main contents include: intelligent cabinets, smart kitchen home products, smart aging product design. Working methods: Politecnico di Torino and Politecnico di Milano, ASP, together with Nanjing University of Science and Technology and Nanjing Forestry University, build a double project team for the main design. Relying on the production strength and market scale of Nanjing Wulian Sensing Technology Co. Ltd. and Nanjing Dongbang Taitai Furniture Co. Ltd., the design and development of smart kitchen home products will be carried out. Experts from these companies will assist in engineering design, and in designing of prototype, in production and in processing. The project includes: industrial design, electronic circuit design, mechanical structure design, information and interaction design and so on. During the project time, Chinese companies will be invited, as Huawei, Xiaomi, Alibaba, NetEase, Suning Appliance and other domestic companies to conduct joint workshop design, formulate workshop topics, and jointly plan the project with both Chinese and Italian professors and business experts. Both teams of graduate students conduct joint research, design and development. The completed prototype design can be completed in Nanjing and cooperated with Shenzhen HAX Innovation Accelerator for product incubation and internet crowdfunding and promotion.

**Team description by  
skill**

The ASP team for this project is composed of 4 members:

- Alessandra Angelucci, a Biomedical Engineering student at Politecnico di Milano
- Lucia Di Terlizzi, a Communication Design student at Politecnico di Milano
- Camilla Mascia, an Architecture Construction City student at Politecnico di Torino
- Nour Saeed, a Mechatronics Engineering student at Politecnico di Torino

Alessandra Angelucci was assigned as the Team Controller of the team whereas Lucia Di Terlizzi was appointed Communication Coordinator.

## Goal

With the aging of the Chinese community, the problem of dementia becomes more evident. The main goal of this project is, by the use of technology, to provide the elderly and people with dementia with new means of home-care.

The technology must also embrace the Chinese kitchen experience. The presence of wooden utensils and cutlery is very common in Chinese culture. Another important aspect in the Chinese cuisine is the visible flame. It should also be flexible and customizable. This is important as the system must be adjustable to the needs of each patient.

## Understanding the problem

Grasping the issue requires understanding the problems and needs of the elderly and PwD in general, and those of China in particular. Visits to Borgo Sostenibile in Figino have provided useful insights: in fact Grace, an Italian NGO, hosts there elderly with dementia in a controlled environment where they can become more autonomous and self-sufficient.

Furthermore, a huge dissimilarity exists between European and East-Asian kitchens. This is an outcome of the differences in culture. In order to better understand the problem, one needs to be aware of the cultural aspects of the Chinese community. A visit to China during November 2018 allowed gaining insights on the Chinese culture.

One important concept is the visible flame in the kitchen. In Chinese cooking, fire is used in the most traditional recipes and the elderly are used to see it clearly. However, this adds a risk factor especially for those with dementia. In order to allow for maximal autonomy, safety must be assured.

Another important aspect is the size of the kitchen. In China, a small space is usually allocated to cooking and, unlike in western kitchens, there is no space for dining together, also because the kitchen space is made uncomfortable by the fire and smoke produced during the traditional cooking procedures. This leads to two main issues. The first one is the poor air quality due to the emissions that happen during the cooking process. The other is the lack of space in the kitchen. This can lead to mobility difficulties for the elderly. Thus, an air quality monitor is needed in order to keep track of internal air condition. Also, modular storage units and flexible workspaces must be included in the kitchens.

An essential factor to take into consideration is the psychological one. Agitation and anxiety are two of the most difficult symptoms of ageing and dementia. Agitation and anxiety are characterized by various activities, such as wandering, repetitive and purposeless behavior, social inappropriate activities and physically and verbally aggressive and non-aggressive behaviors. Agitated people with dementia can harm themselves, their caregivers or other patients in a care facility. Automatic detection of anxiety can alert caregivers so that appropriate interventions are performed.



Lunch time at Hefei housing for elders (China)



The team and the professors at Huawei (China)

## Exploring the opportunities

Various ideas were generated during team meetings and a workshop in China. Smart refrigeration systems, collapsible preparation platforms, water filtration systems and air monitoring were some of these ideas.

The team went to Nanjing, China, to take part in a workshop at Nanjing University of Science and Technology in cooperation with Nanjing Forestry University and Southeast University. Visits to companies as Bigtime and BLUM helped to provide insights to kitchen design and ideas for several mechanisms. Other visits to Huawei and Wulian Sensors introduced the ICT world in China along with sensors technology available.

In the end, three main project concepts were evaluated. The first one is a modular kitchen that is also customizable. The second is the redesign of the



Chinese kitchen. This solution is rigid with different components hidden inside the kitchen. The last one was an upgradable toolkit that contain several components which serve a purpose.

Various criteria must be considered. Flexibility and customization are important as each patient is different from the other. Being traditional can help in the acceptance of the system. The system should also be simple to use and economically available to the end-user. In the end, the concept of developing a kit of tools was chosen because of its greater flexibility and affordability.

## Generating a solution

In order to increase autonomy and safety for PwD, the toolkit approach has been employed. The overall system has been named Bliss, Balanced Living Integrated System for Seniors. People with early stages of dementia were considered as primary users for the system. However, patients of different stages can also benefit from the system.

*Bliss* provides a basic kit and an upgraded kit.

The basic kit contains four components: A transparent pot holder (Fire) provides safety while keeping the flame visible. A multifunctional easy storage system (Box) is also proposed as part of the basic kit. Extendable joints permit the change of the storage into a workbench and add ergonomics. The third component is an indoor air monitoring device which provides caregivers information on the internal air quality (Lotus). This devices has the shape of a lotus flower and is made of bamboo. A humidity control panel (Drop) is added to the kit. This panel also serves as a mental training exercise as this solution is a DIY solution.

The upgraded kit, which introduces the Help function, includes an anxiety detection camera. The level of anxiety can be measured based on body movements and certain behaviors. The usage of an RGB-D camera can help in getting more information from the user and can be used in the dark. The same camera can be also used for fall detection. This camera can alert the caregivers and eventually intervene by activating other components of the upgraded kit. This kit incorporates a smell and sound diffuser (Lotus+) which uses sound and smell therapy to relax anxious PwD. Drop+ is another element of the Help kit: it consists of an upgrade of Drop which includes LEDs in order to perform light therapy to reduce anxiousness in PwD.

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