

*Shike时刻: Chinese-Character Clock of Simplicity and Functionality
designed and built by Xuyang Cao and Yankuang Gu*

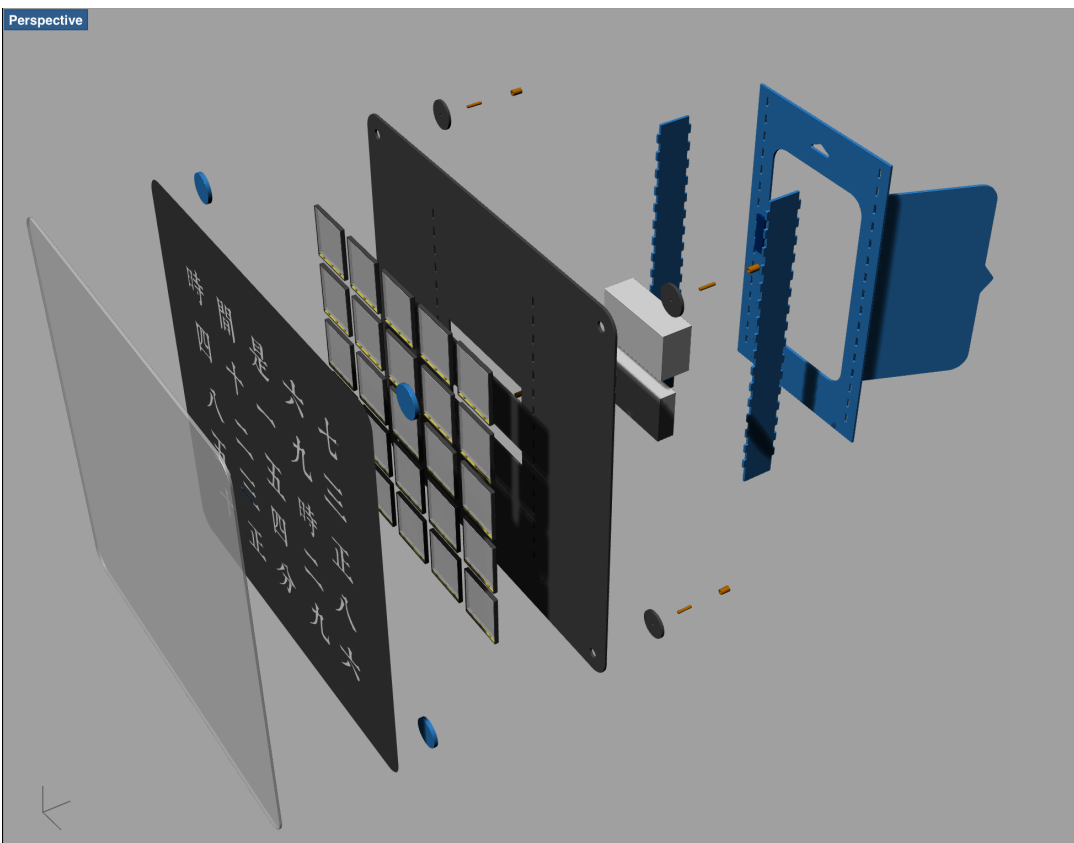
What is Shike?

Shike is a clock displaying time in a traditional way by lighting up right Chinese characters, yet it has modern exterior and technology like auto brightness and supportive Android application for time setup. Therefore the clock essentially fuses Chinese cultural elements and the contemporary design together.

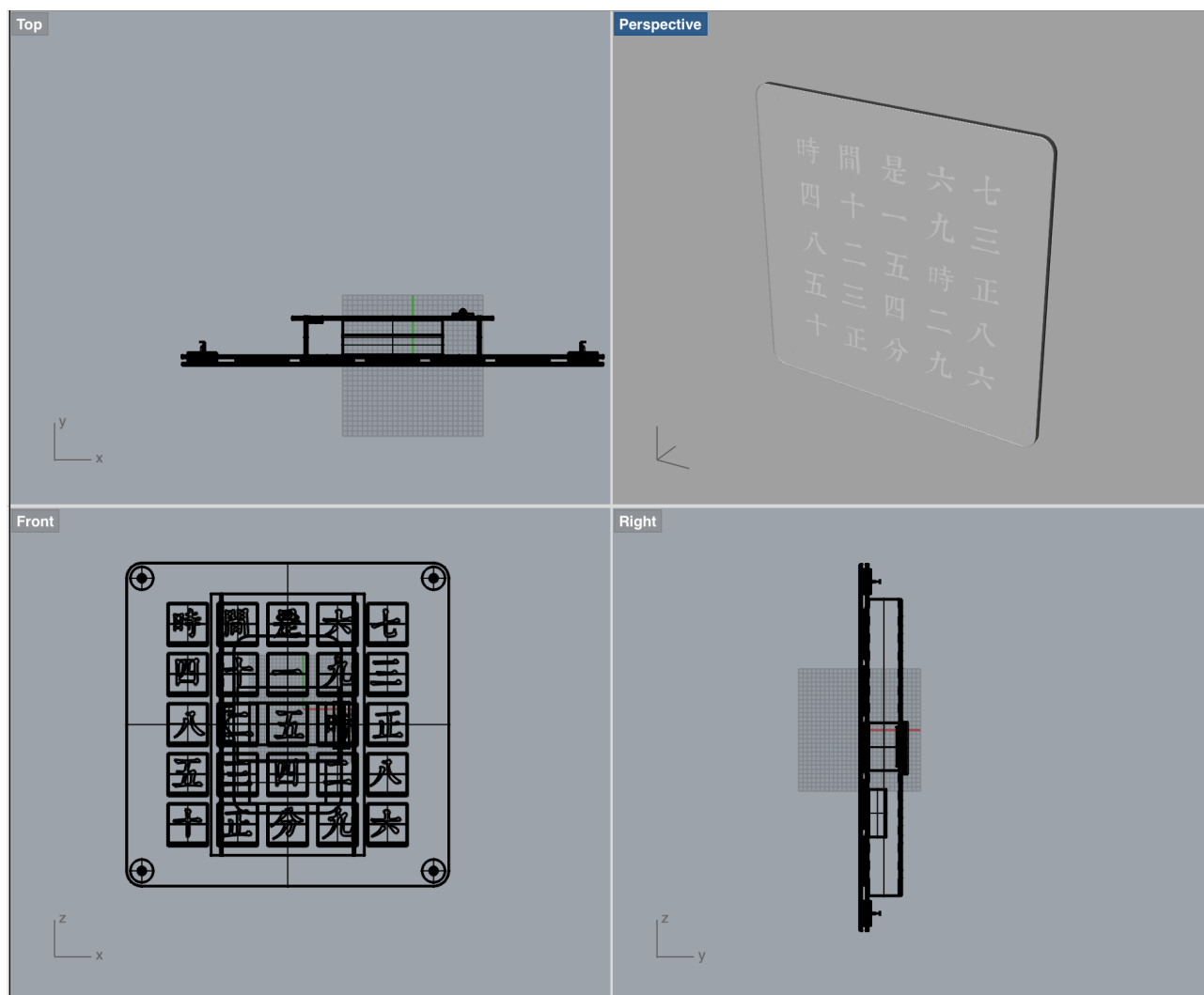


In most homes, the presence of clock has been obscured since people own so many electronic devices able to show time like Apple Watch. While a glimpse on the screen immediately tells time, a well-designed clock put on the wall not only provides users with the same information but also serves as a creative art product. Considering this aspect ignored by most people, during the summer in 2016, I joined a makerspace called Fablab in Shanghai to learn product design as well as basics of electronic engineering. Then with my lab partner I committed to build a clock blending our own cultural beauty with the western modern feeling. We called it 时刻 (pinyin: Shike, translated as moment).

We decided to use Chinese characters to display time since it is calligraphic and elegant. After fully considering the spatial arrangement and the way most users read time, we selected only 25 characters to be showed on the screen. Minimizing the number of characters made our potential users easier to learn the clock while the fun of getting to know the Chinese characters was not compromised.



Rendering and 3D Models We Created Before Starting Building the Functional Prototype of the Clock



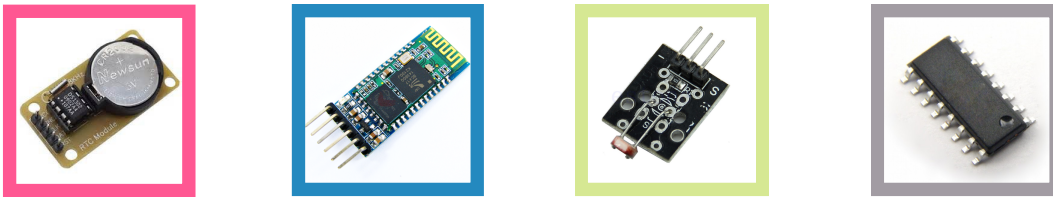
Engineering and Design

Based on Arduino microcontroller board MEGA2560, the essential module **DS1302** served as the RTC (real time clock). I systematically analyzed the library of RTC, modified, and loaded it into the board. After that, I wrote codes for each pin and connected LED lights to the board so the correct combination of Chinese characters would be illuminated when the corresponding time was reached. My lab partner Yankuang Gu used AutoCAD to design details and laser-graved 25 characters into the acrylic plate of the clock's exterior.

Day by day, we got so caught up in the process of creation, that eventually, we were driven out of the lab by the irked security guard after exceeding the normal laboratory hours. We ran to a nearby convenient store. "Two crazies," we joked. Borrowing the store's counter top, we kept working till midnight. My lab partner took the last train home while I strolled back to my hotel.

In the next few days, I programmed and my partner designed the UI: a supportive Android application for the clock was created, allowing users to customize the timing and intensity of the LED. In addition, with the **photocell** and special algorithm I wrote, auto brightness was also achieved, and people could experience an optimal range of brightness targeting users' eye comfort in different environments. **HC-05** Bluetooth module was added to main body so that communication between the phone and clock was enabled. The Android device that served as a client sent data to mega 2560, which, as a host, would make wanted changes.

At the beginning, the available number of PWM pins was far below our expectation (PWM can achieve analog result by customizing the duty cycle and allow the brightness change of an LED). After researching and communicating with our instructor Mr. Chen, I found a creative way to solve the problem. By using **CD4051** module, three normal pins could be set up to simulate digital switch. Then, based on the module's special circuit, switches could be combined and lead to PWM. By this means, I gained 8 extra PWM pins, all of which after our modification functioned well. Eventually 25 LED behind the Chinese characters could be set up to desired brightness.

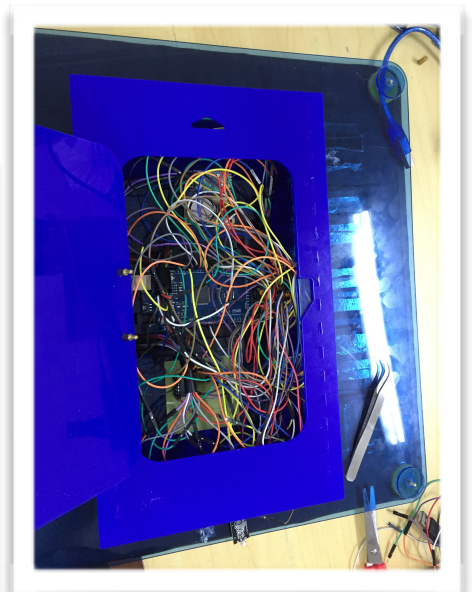
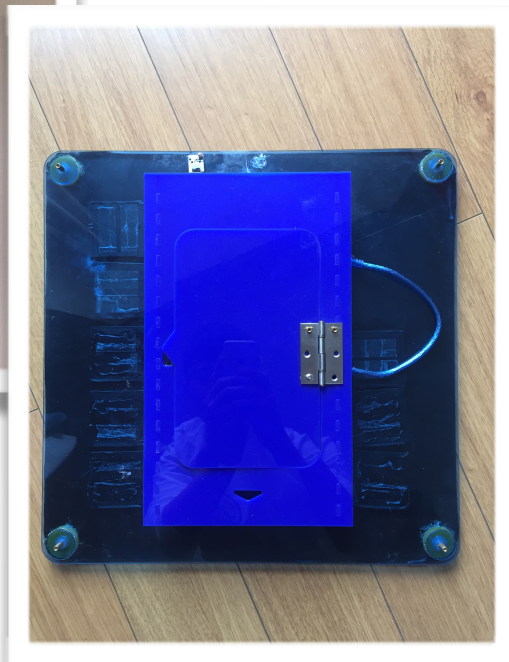
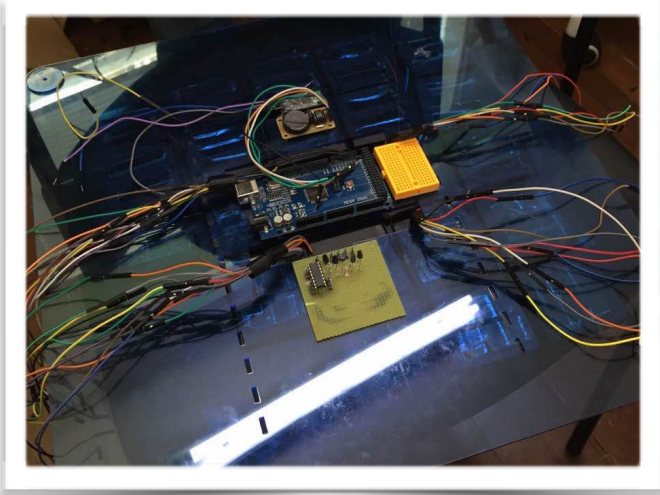
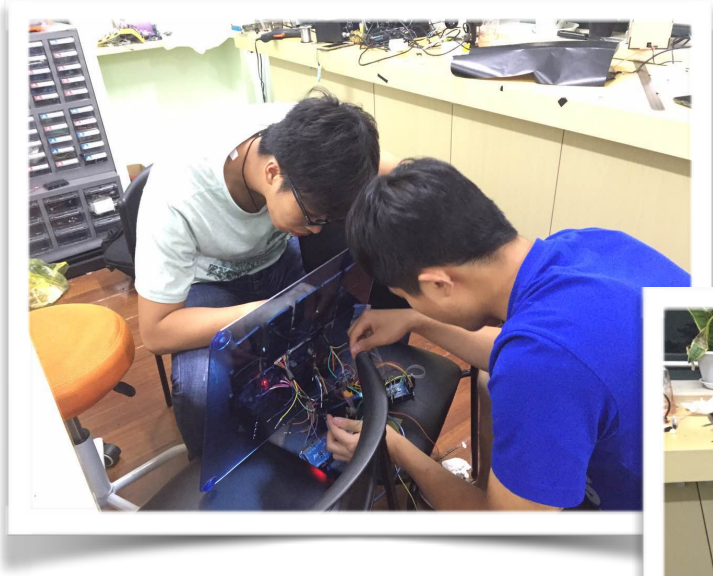


Pink: DS1302; Blue: HC-05; Lime: Photocell; Gray: CD4051



The Supportive Android Application

In the Middle of Assembling the Clock



The clock was ranked as one of the most creative and user-friendly products in final review. Since the people in Fablab showed genuine interests in our prototype, I discovered that the ingenious use of technology could serve as an innovative vehicle for promoting my cherished cultural traditions and bettering people's lives.

View the clock's model online:

Shike Exploded View: <https://skfb.ly/YWQr>

Shike 3D Model: <https://skfb.ly/YWQM>