In order to achieve the goal which is previously mentioned, we made some simplifications to make our project viable in 3 days without the loss of the core technology. The major goal for us is to transfer message from the traffic lights to the cars, and to make the car accelerates exactly when the prior car accelerates. In light of the first goal, we fabricate 2 cars, making the follower car keeps a constant distance to the leader car. Due to the limitation of the components, we employs a remote control as a sender to the traffic lights and the cars. Thus, we divide them into 3 parts, traffic lights and 2 cars. What we try to achieve is that we can show the remaining time of the traffic lights on the LCD screens and try to remain the distance between the two cars constant when the prior car moves.

This is the wiring diagram of the traffic lights. We utilize a LCD screen to show the remaining time of the lights. Here is the video. (video) “Red to” means the remaining time of red lights. We use an IR receiver as well to receive the signal send by the remote control. We use three LCD of three colors with resistors to show the traffic lights.

This is a brief model for the car. We have 4 wheels, two of which are equipped with stepper, while the rest two have no power. The boards and battery are put on the car.

This is the wiring diagram of the prior car. Apart from the LCD and IR control, we apply a driving chip to the car to amplify the voltage for the car.

This is the wiring diagram of the latter car. The difference is that we load an ultrasonic sensor to determine the distance between the prior car and the latter car. We utilize I/O distance measurement, which means we send 2 microseconds high level signal to the pin, and the module send 10 square waves at the frequency 40 kHz. We then detect the returning time of the ultrasonic sensor and use the formula to calculate the distance.

In order to assure constant distance between the two cars, we create a formula to find the proper parameter of the stepper. If we aim to make the distance constant, we can set the velocity of the latter car same as that of the prior car, in light that the car is immobile at the beginning. Since the direction is set, we only need to set the speed. As for how to find the proper speed, we consider to find the change of the speed of the adjacent small time interval rather than straightly find the speed. The change of speed can be found through the relative speed of the two cars, which should be zero at any time. In a very small time interval, say, 0.02s, the motion of the cars can be viewed as ULM. We can find the change of the distance to obtain the relative speed, and then find the speed of the latter car. The speed of the latter car equals to the linear speed of the wheels. According to the physics formula shown, we can set the parameters Stepper.setspeed()