

**IZMIR UNIVERSITY OF ECONOMICS
FACULTY OF ENGINEERING**

FENG 497 SYSTEM DESIGN



Arduino-based automated irrigation system

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SYSTEM DESIGN

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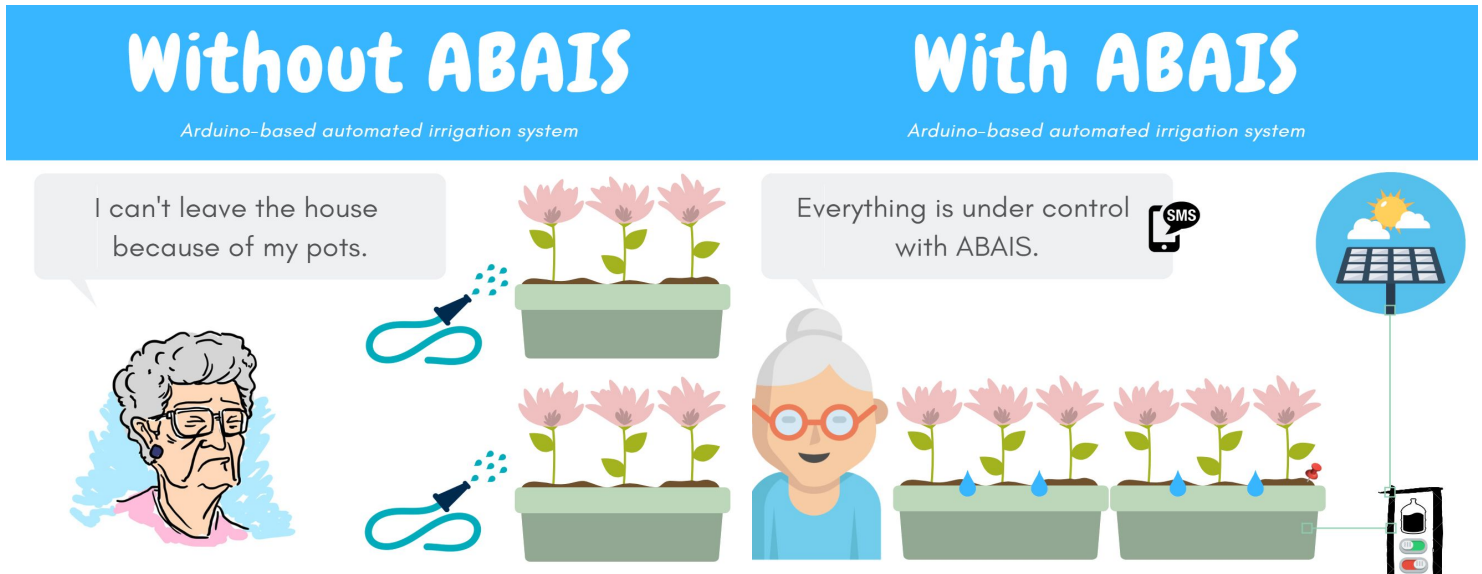
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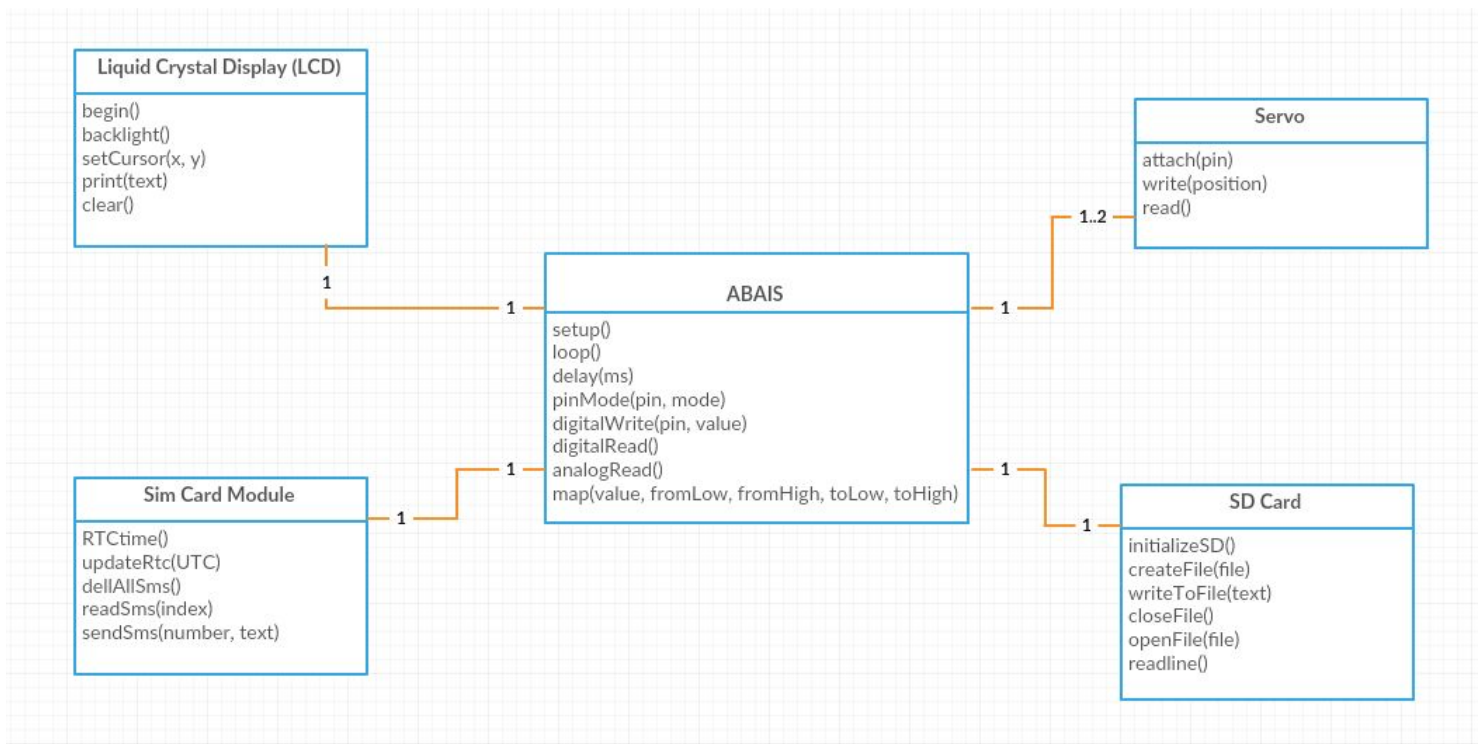
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Overview



(Figure 0 (a), (b) - Before and after ABAIS)

The contribution of ABAIS to daily life is shown in Figure 0 (a) and (b) in simplest form. As can be seen, plants expect daily attention in an environment where there is no ABAIS. At that situation, arises addiction to the home. However, this problem disappears with ABAIS.



(Figure 1 - Libraries and functions used in ABAIS)

1. Diagrams

1.1. Use Case

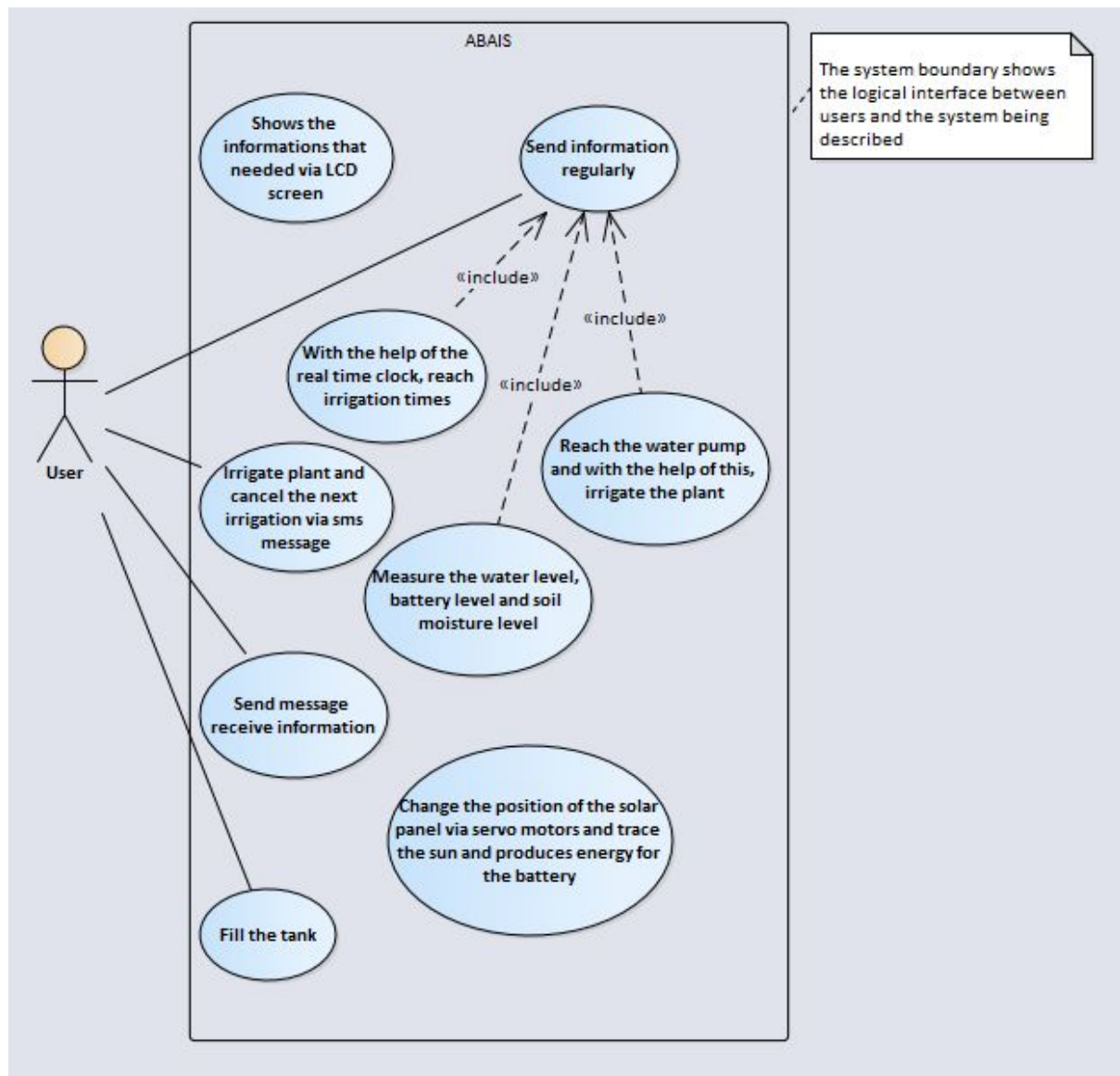


Figure 2

As shown in Figure 2, ABAIS is described in general as use case diagram. First, the user can send a message to ABAIS and receive the necessary information as seen. These are watering time, irrigation, water level, battery, soil moisture level information with the help of real time clock. As mentioned, the user can irrigate plant and cancel the next irrigation via SMS message and user can fill the tank. When the time comes, the ABAIS takes water from the tank with water motors and watering the plant. The system shows the information that needed via the LCD screen. The solar panel in the system adjusts its position to the sun with the help of servo motors and collects energy from the sun for the battery. Finally, the user can retrieve all information from the system via message.

1.2. Activity Diagrams

1.2.1. Taking and sending information

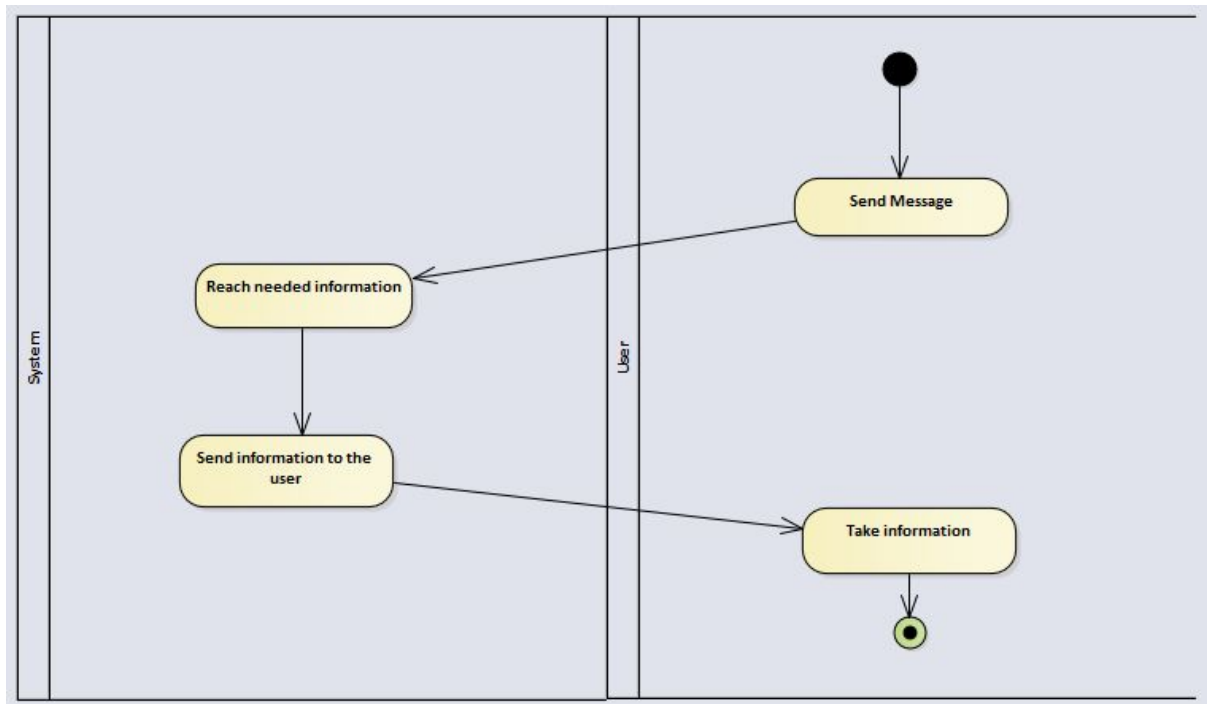


Figure 3

In the activity diagram shown in Figure 3, the user sends a message to the system and the system sends the information to the user after reaching the needed information. Information retrieval is like this between the user and the system.

1.2.2.Sending information by system

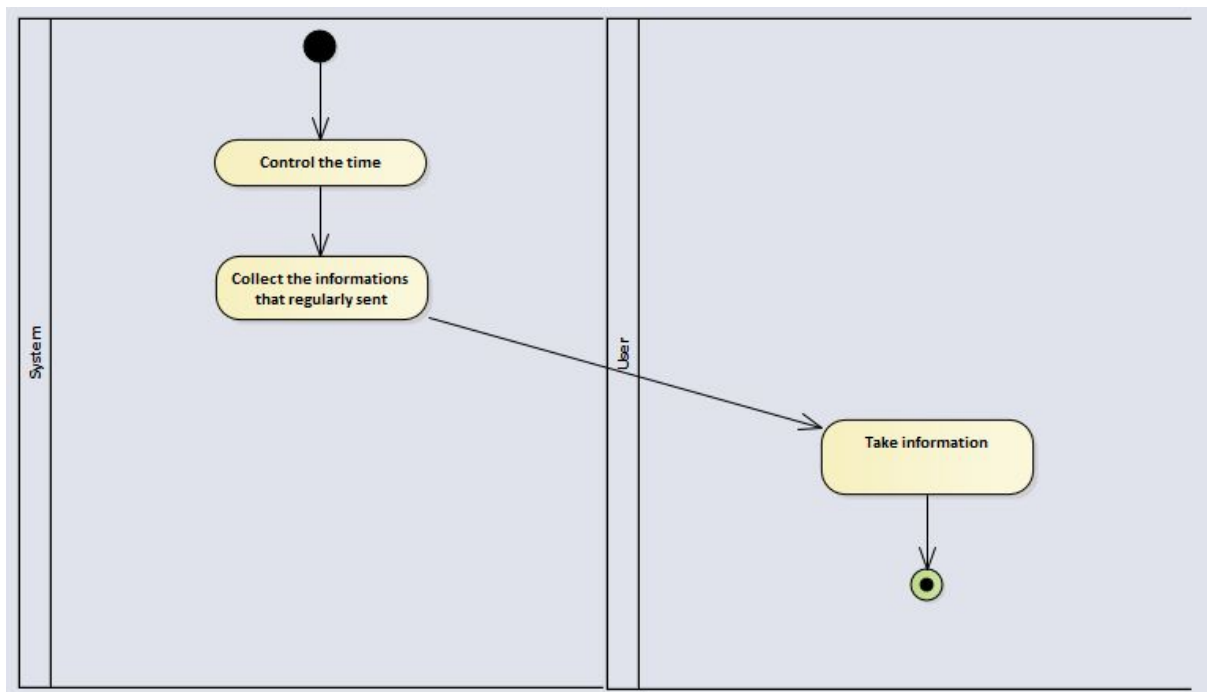


Figure 4

In the above-mentioned activity diagram, the system first checks the time. Then the system collects the information and sends them regularly to the user. The user receives this information regularly. As shown in Figure 4, this information is regularly performed by the system.

1.2.3. Filling the tank

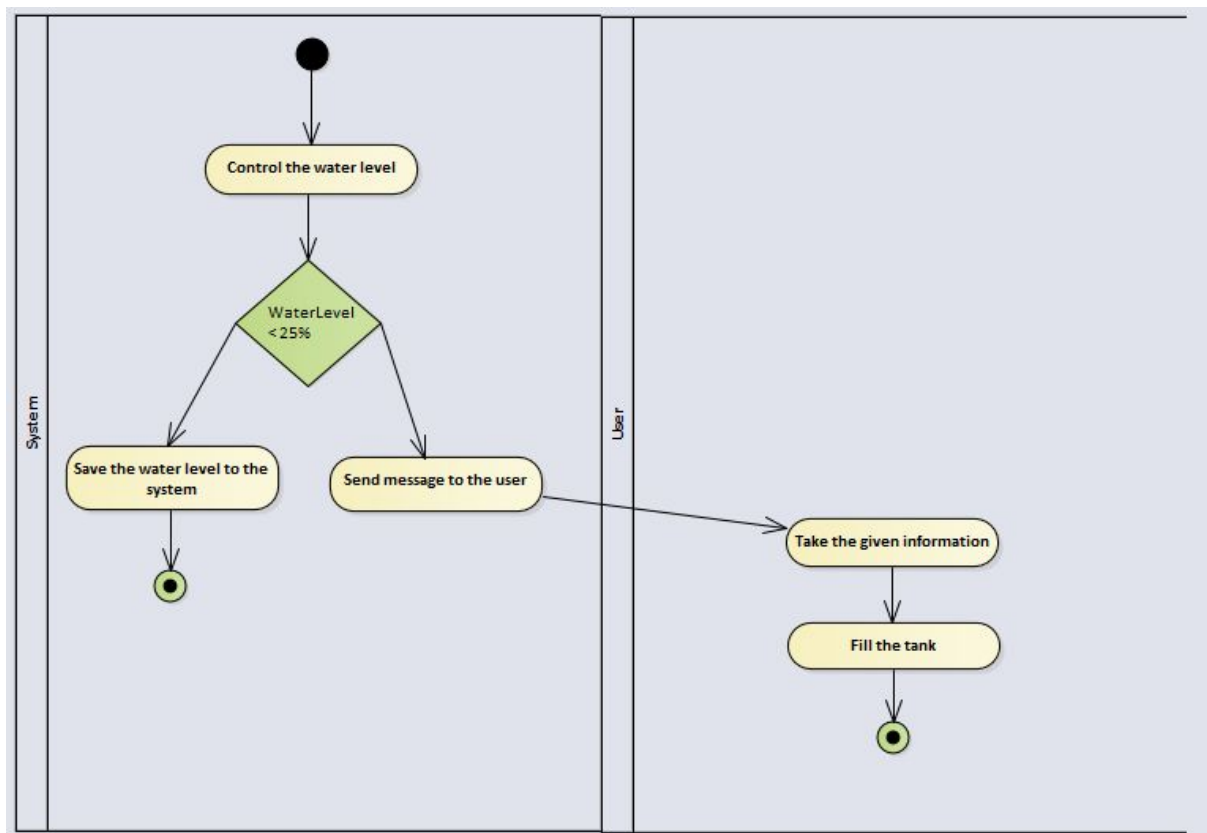


Figure 5

When filling the tank, the system first checks the water level of the tank. According to come information from the water level sensor, if the water level is above 25%, the system saves the information. If the water level is less than 25%, the system sends information to the user. The user receives the information and performs the filling of the tank.

1.2.4. Changing irrigation plan

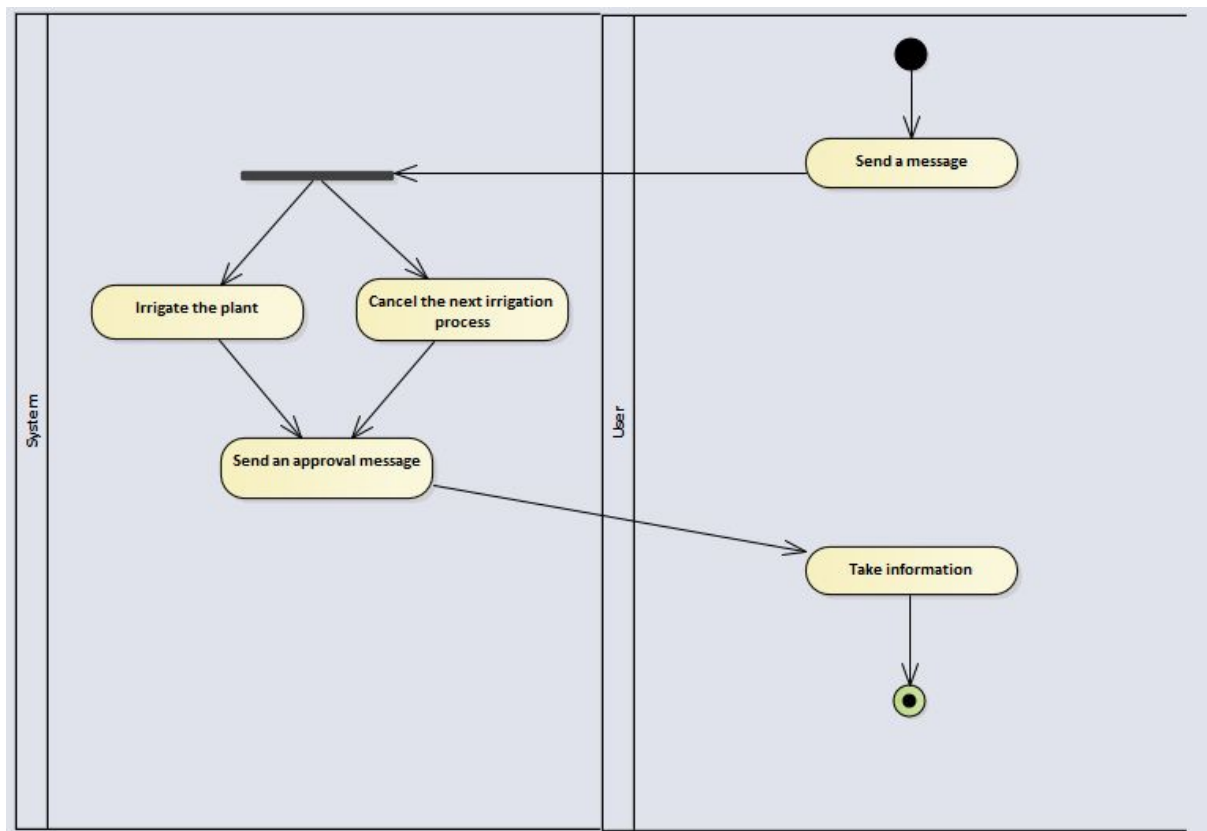


Figure 6

The diagram drawn in Figure 6 is related to the irrigation plan. The user can message to the system to water the plant or cancel the next irrigation process. When one of these processes occurs, the system sends an approval message to the user. In this way, the user receives the approval of the process.

1.2.5. The measurements that water level and soil moisture level

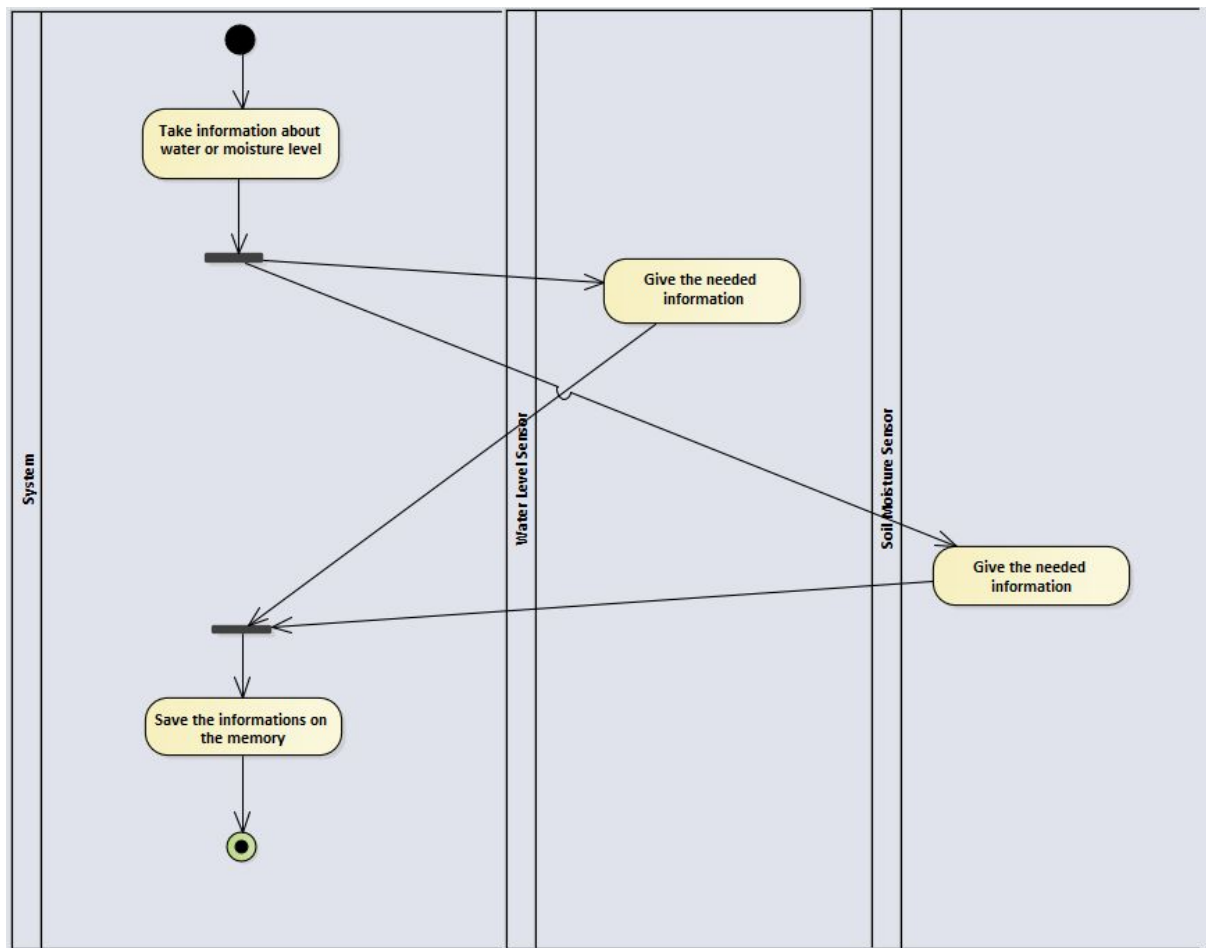


Figure 7

Figure 7 shows the measurement of water level and soil moisture level. The system receives and stores information from the water level sensor and the soil moisture sensor.

1.2.6.Irrigation time

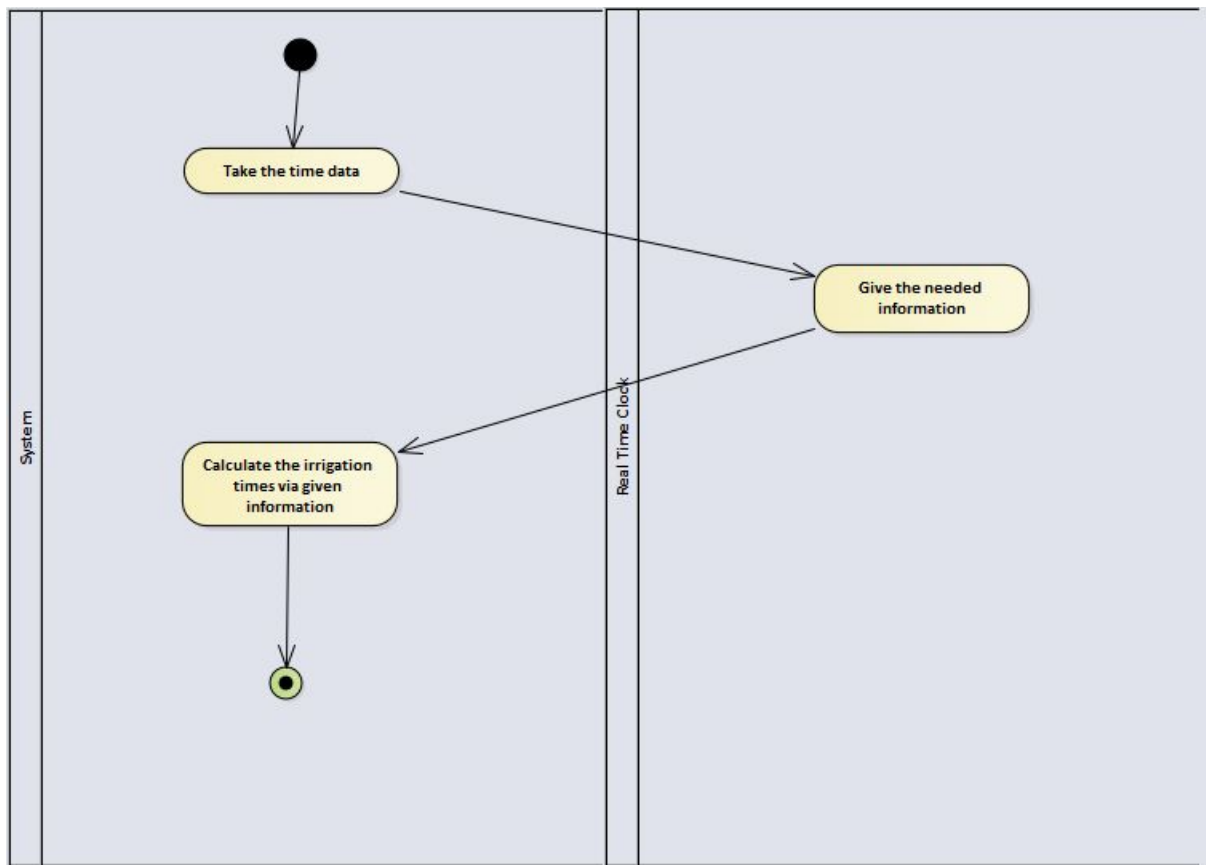


Figure 8

The irrigation time of the system is indicated in Figure 8. The system first takes time from the real time clock at this stage. The real-time clock gives the system the required time and the system calculates the irrigation time based on the information from the real-time clock.

1.2.7. Irrigation process

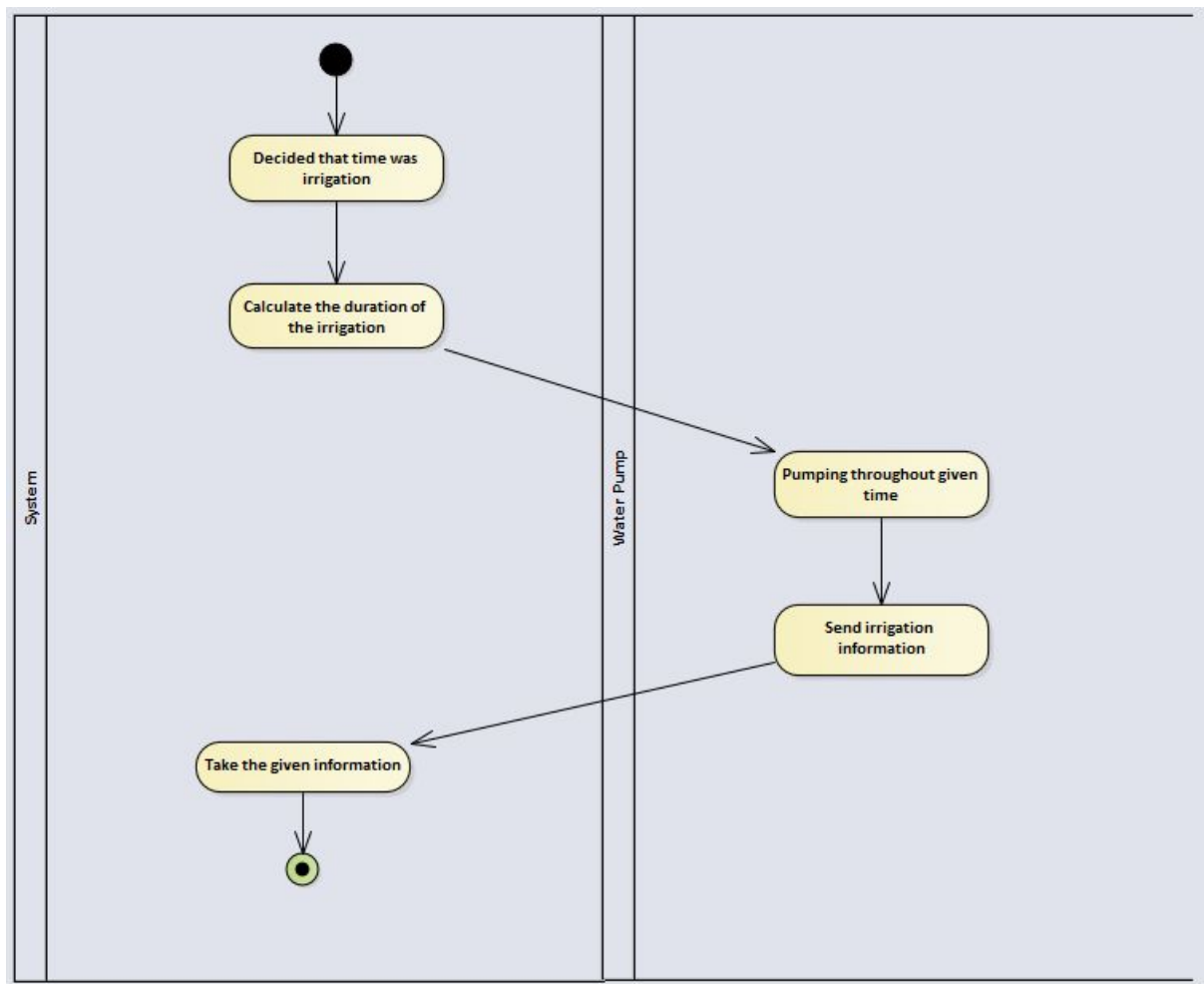


Figure 9

The irrigation process works as shown in Figure 9 above. The system decides the irrigation time after finishing the process in Figure 8. After that irrigation time is calculated by the system. After the calculation is over, the system sends the time to the water pump and the water pump pumping throughout the given time. After the watering process, the water pump sends the irrigation information to the system. The system receives this information.

1.2.8. Locations for energy production

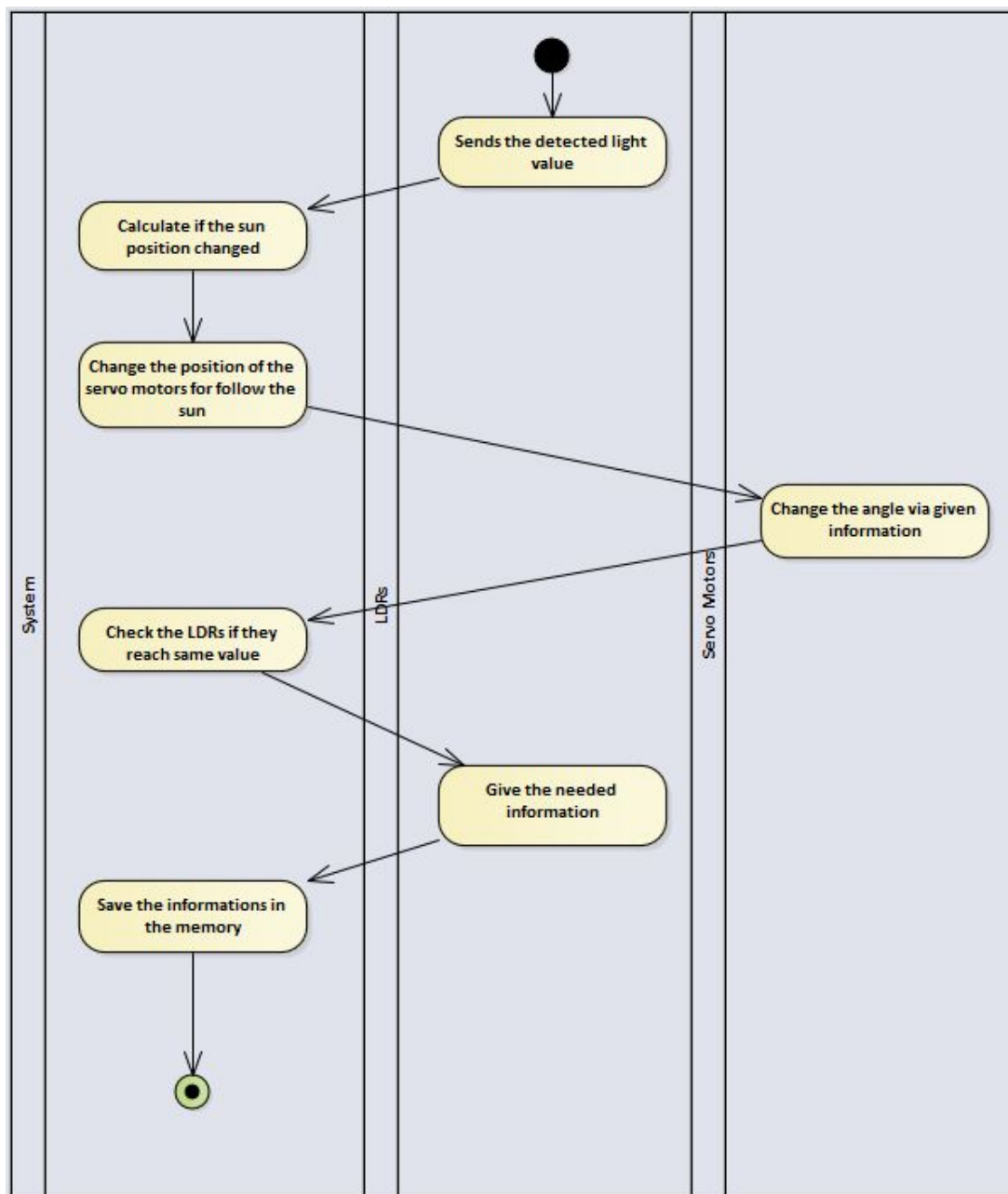


Figure 10

The LDRs send the detected light values to the system. And then the system calculates if the sun position change. And then the system calculates if the sun position change. After that, the process takes place in servo motors. Servo motors change the angle according to the incoming information. The system checks the LDR for the same value and LDRs give needed information. Finally, in Figure 10, the system saves the information and the process ends.

1.2.9. LCD display information

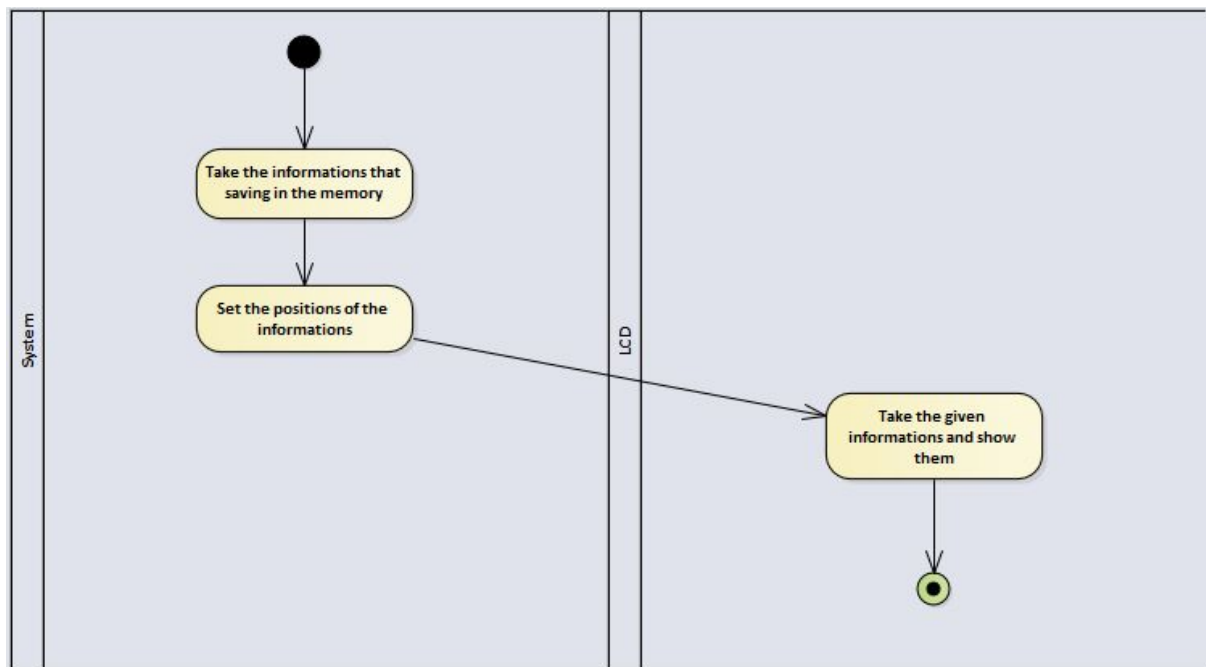


Figure 11

LCD display information shows in Figure 11. The system receives the recorded information from the memory and sends the position of the information to the LCD after editing. LCD takes the given information and shows them.

1.3. Communication Diagrams

1.3.1. Information retrieval

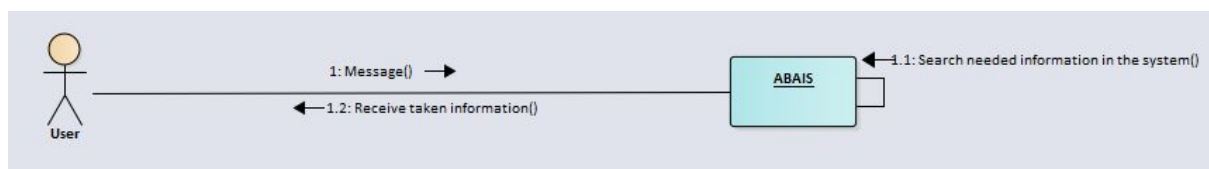


Figure 12

In the communication diagram drawn in Figure 12, the user sends a message to the ABAIS system and ABAIS searches for the requested information. ABAIS transmits the required information to the user after the search.

1.3.2. Needed information to be given after time control

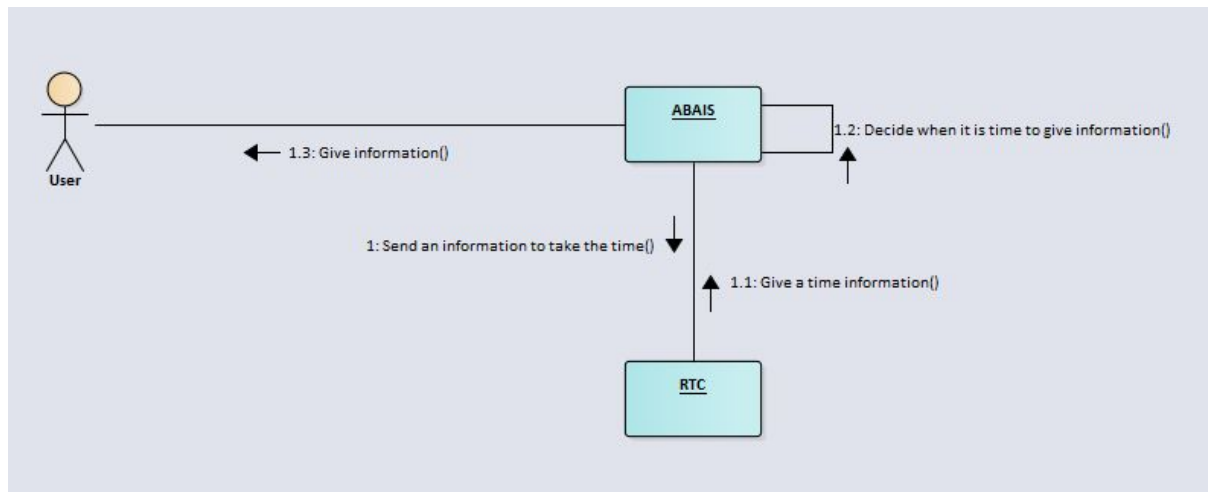


Figure 13

In Figure 13, the system transmits information to the user. The system receives information from the real-time clock to learn the time. Real-time clock notifies the time to the system. ABAIS transmits the information to the user when it is time to give information.

1.3.3. Information for tank and control of tank level

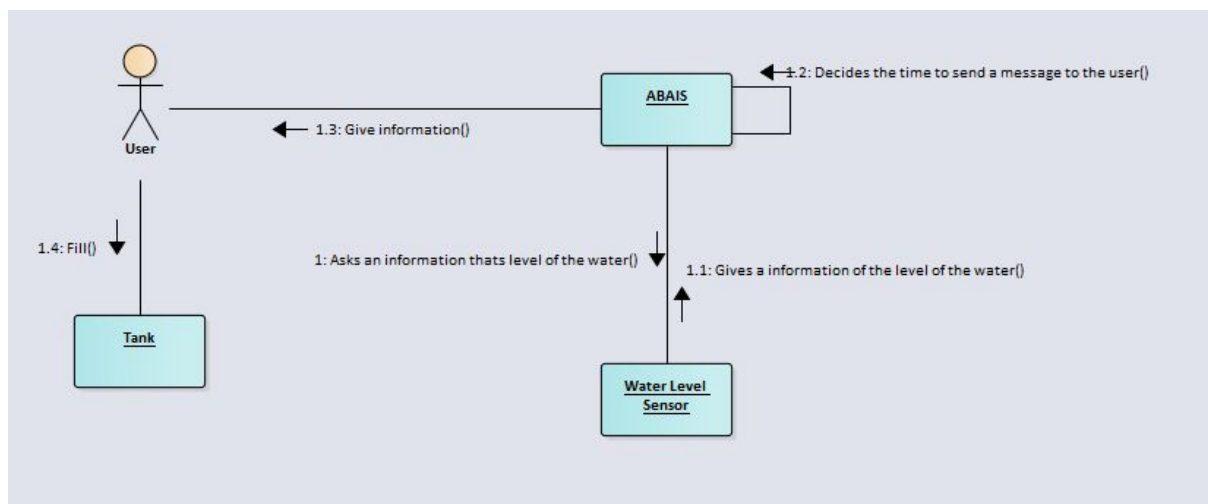


Figure 14

Figure 14 gives information about the tank information and level. ABAIS asks information about the level of the water from the water level sensor and water level sensor gives information about the level of the water. The system decides the time to send a message to the user. The message is sent to the user. User fills the tank.

1.3.4. User changes the irrigation plan

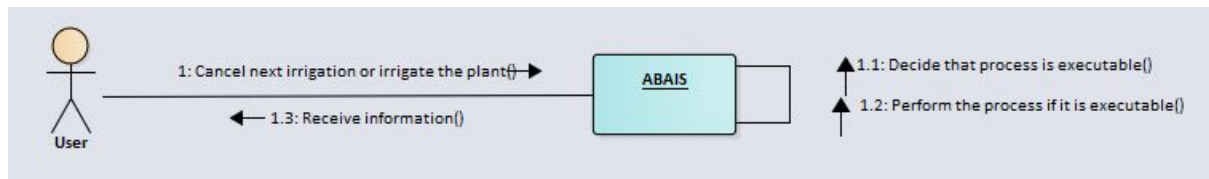


Figure 15

Figure 15 shows the user can perform the irrigation process or cancel the next irrigation process. The system process according to the taken information and sends information to the user.

1.4. Sequence Diagrams

1.4.1. Information retrieval

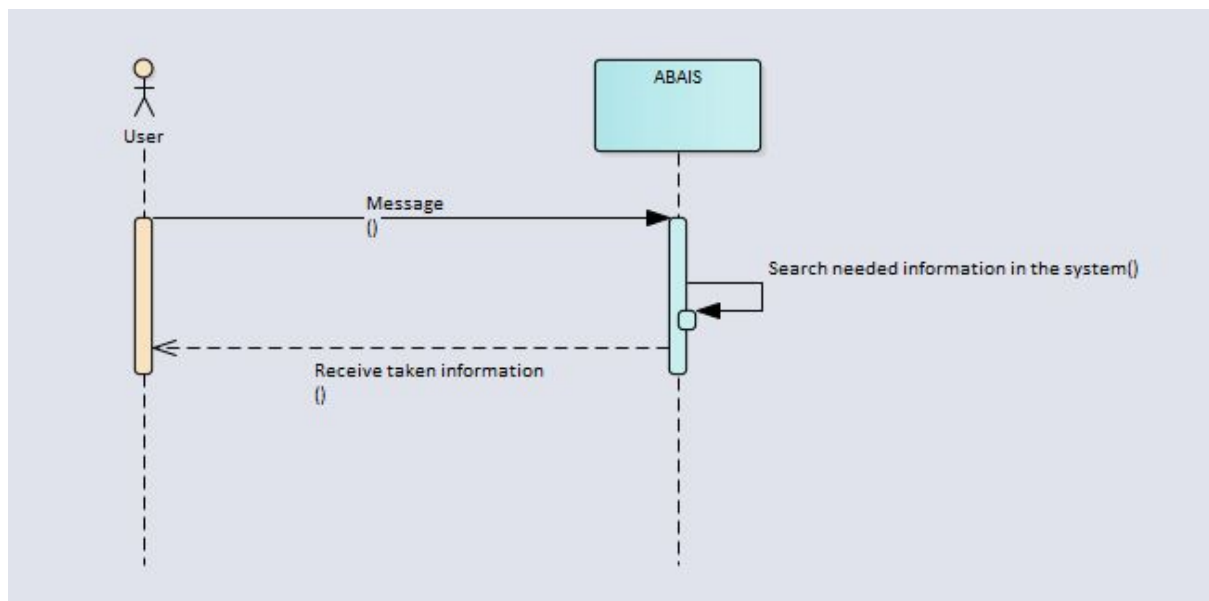


Figure 16

User requests information from ABAIS via message. The system reaches the requested information and transmits it to the user. The sequence diagram drawn in Figure 16 gives this information.

1.4.2. Needed information to be given after time control

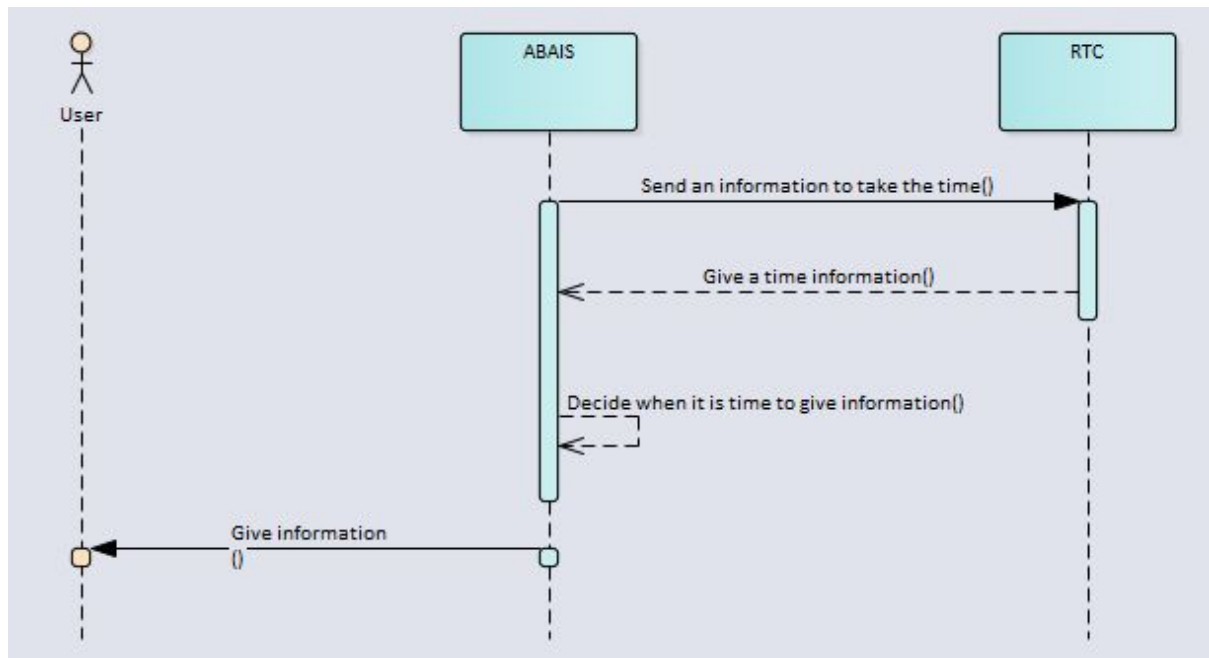


Figure 17

Figure 17 after time control, the system transmits the necessary information to the user. ABAIS takes the time information from the real-time clock. And then decides when it is time to give information. Finally, after all these processes, the information is transferred.

1.4.3.Information for tank and control of tank level

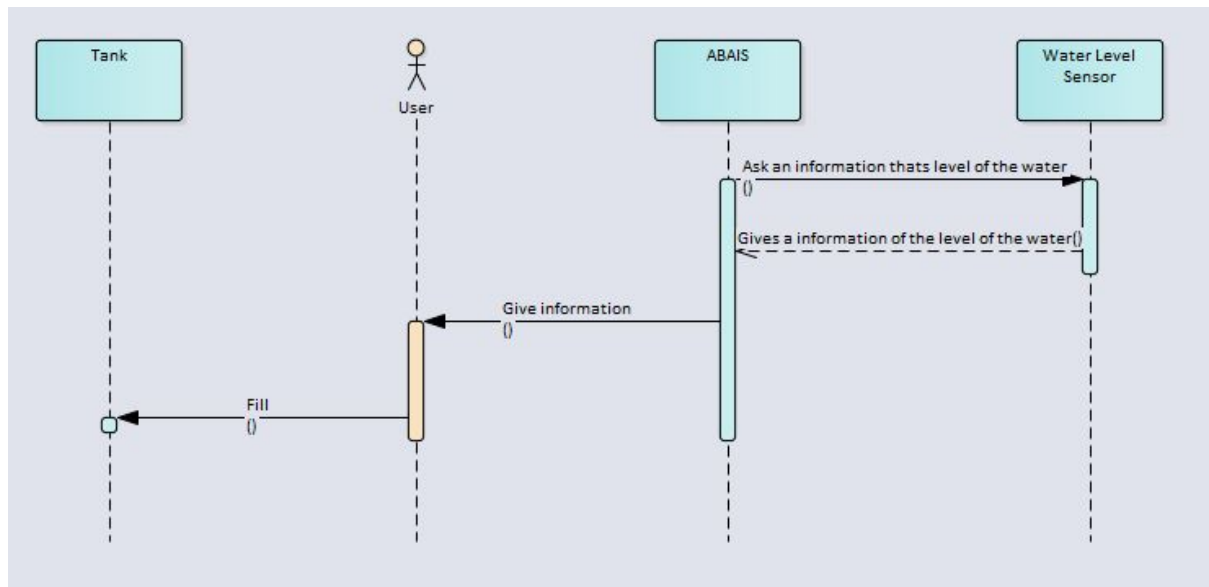


Figure 18

In this flow diagram, the system learns the condition of the tank with the water level sensor. The system sends information to the user according to the state of the tank and the user fills the store.

1.4.4. User changes the irrigation plan

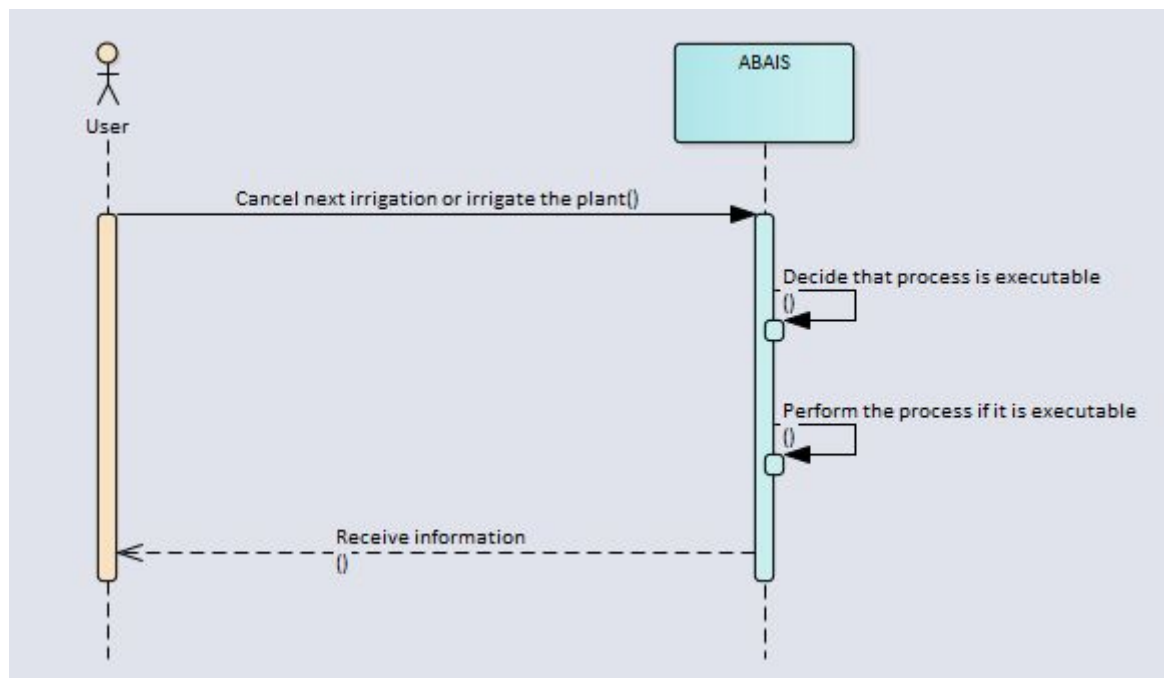


Figure 19

Figure 19 shows that the user can make changes to the irrigation plan. ABAIS makes decisions based on the information received from the user and applies the processing. And the system transmits to the user.