ZUIS

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FLOODS & FLASH FLOODS PREDICTOR

ALERT SYSTEM FOR FLASH FLOODS

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Introduction

Flood: An overflow of water onto normally dry land. The inundation of a normally dry area caused by rising water in an existing waterway, such as a river, stream, or drainage ditch. Ponding of water at or near the point where the rain fell. Flooding is a longer term event than flash flooding: it may last days or weeks.

Flash flood: A flood caused by heavy or excessive rainfall in a short period of time, generally less than 6 hours. Flash floods are usually characterized by raging torrents after heavy rains that rip through river beds, urban streets, or mountain canyons sweeping everything before them. They can occur within minutes or a few hours of excessive rainfall. They can also occur even if no rain has fallen, for instance after a levee or dam has failed, or after a sudden release of water by a debris or ice jam.

Flash flood in Jordan:

In **26/October/2018** flush floods struck many areas of dead sea in Jordan, 21 person die in this flush floods, those people where Hiking in *Zarqa_Maeen* valley which is beautiful valley ,the weather was good ,no rain, no wind , sunny and warm. Suddenly the flush flood struck the valley many people can`t run away from water specially children whom were in school trip in this valley , 12 school children die in this Horrible flush floods .

After two weeks in **10/November/2018** another flush floods struck several areas including the popular tourist spot of Petra another 12 tourists die in south Jordan areas .

These floods have become a risk to Jordanian people and tourists, so we decided to study the geology of these valleys to understand how this flood form , and make a device to protect the people in valleys and tell them to take care before the flush flood arrive to them .

Pic(1+2) two flash floods in south of Jordan

Pic(3) : news about *Dead Sea* flash flood 26/10/2018

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Jordan

Jordan: flash floods kill 12 and force tourists to flee

Death toll rises a day after floods struck in several areas including the popular tourist spot of Petra

Agencies

Sun 11 Nov 2018 01.40 GMT

475

This article is over 2 months old

▲ Flash floods have devastated parts of Jordan, including the ancient city of Petra.JORDAN- Photograph: -/AFP/Getty Images

pic(4) : news about *Ma `an* flash flood 10/11/2018

Geologic study for dead sea area

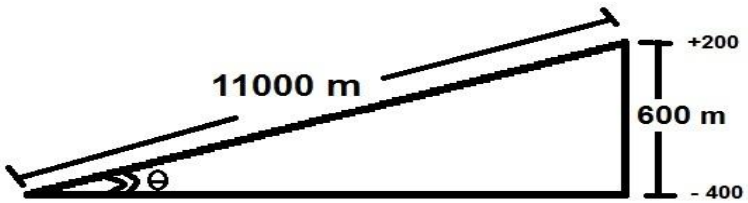
In **5/1/2019** we started study the geology of Zarqa-Ma`een valley to understand flush flood formation , we can't go to the valley Because the government prevented students from visiting flood areas and valleys.

So we had to study the valley through Google Maps , We also consulted a geology teacher named Omar Shaheen who had studied the valley, gave us pictures of the valley and learned the geology of the entire region during a ten-day course **(from 10/1/2019 to 24/1/2019).**

The valley (Zarqa _ Ma`een)

The valley extends a distance of 11 km

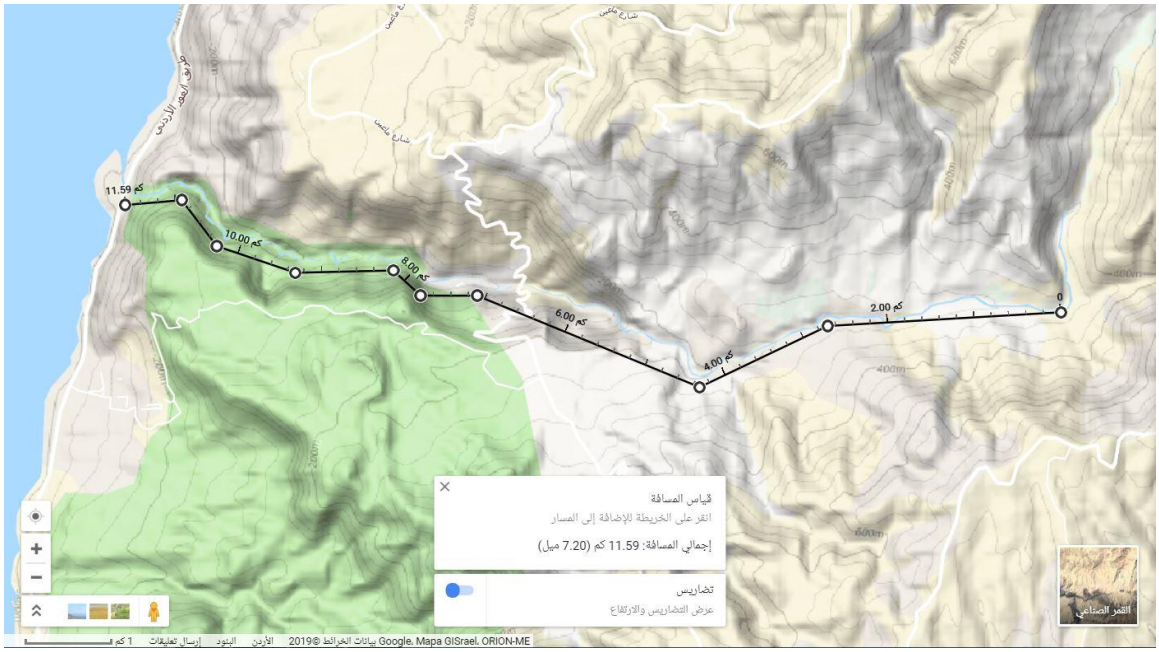
The maximum height of the valley is 200 meters above sea level and the lowest rise in the bottom of the valley 400 meters below sea level, and by knowing the difference in the height of the valley, and the distance of the extension we conclude that the **sin of** average **slope** in the valley is the **difference in height divided by distance.**



$$\sin\theta = \frac{600}{11000} = 0.0545$$

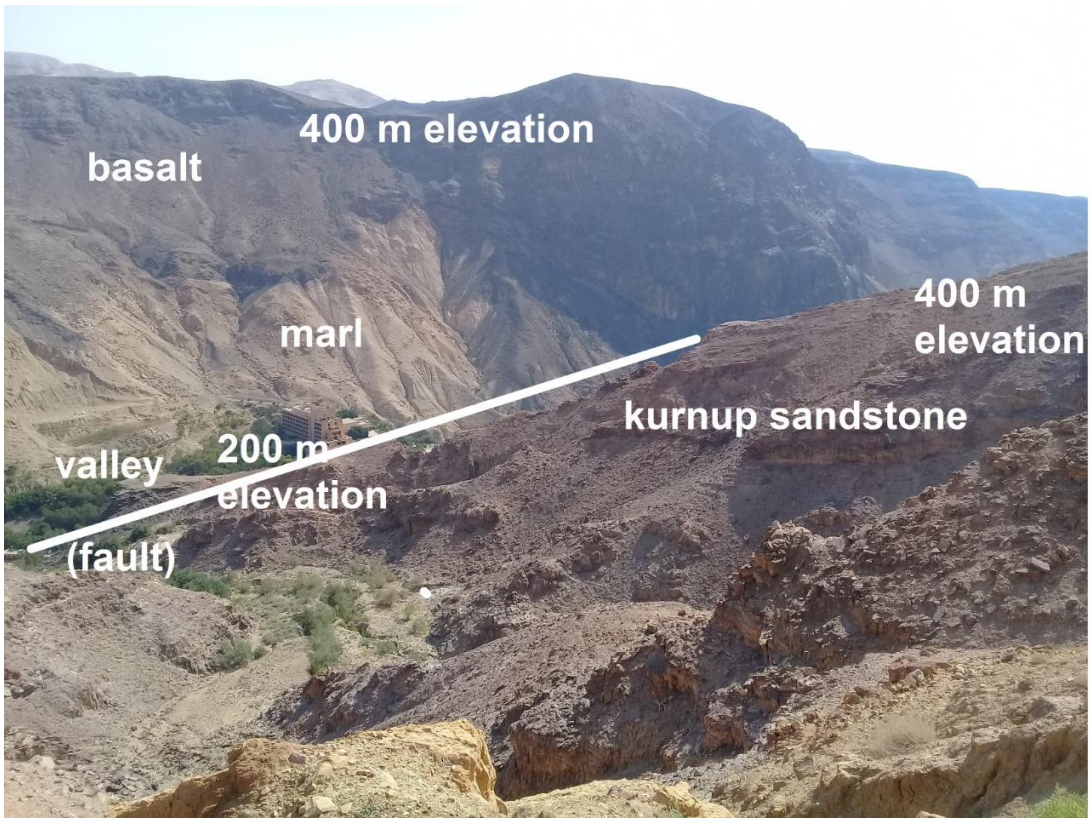
$$\theta = 3.13^{\circ}$$

Fig(1) figure showing the slope of the valley

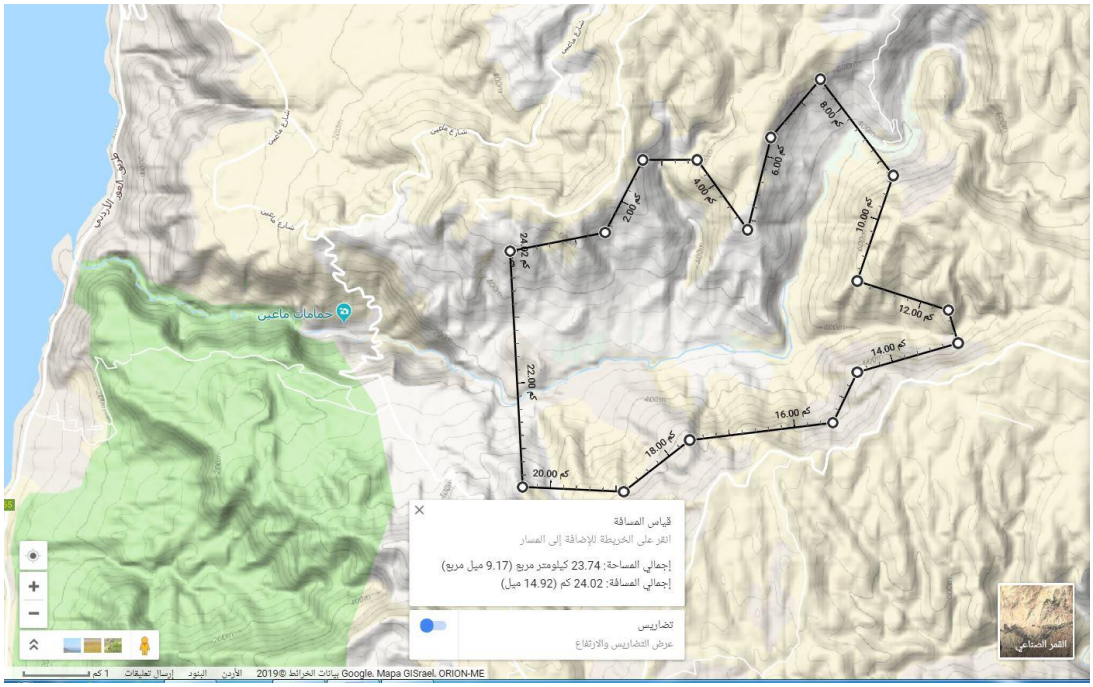


Pic(5) average distance of Zarqa_Ma`een valley 11 km

Pic (6) Aerial photograph of the valley



Pic(7) Geology of upper side of the valley



Pic(8) the catchment area

The eastern side of the valley (the highest side) is composed of basaltic flows unit , the basalt is igneous rock and it permeability is very low so, the rain water runoff is very high, that's mean:

If the catchment area of rain was 24 km^2 and the precipitation amount was 4mm in 15minutes , the volume of water that will runoff within the valley is 960m^3 in 15 minutes.

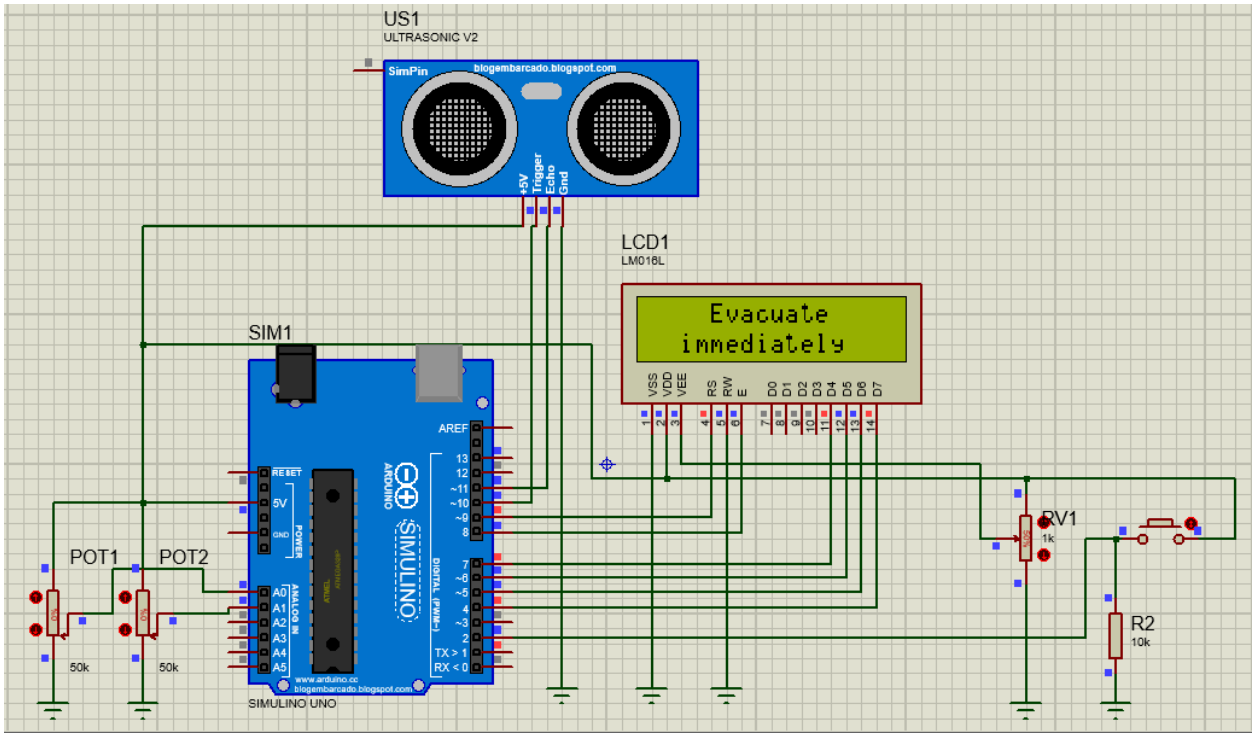
This accumulated volume of water will form a flush flood and it will runoff in the valley towards the dead sea so, this flood in such situation will be very dangerous because it will arrive suddenly to the bottom of the valley and will Threaten the people and tourists in the dead sea, such situation happened in *Dead Sea* flush flood 26/10/2018, and killed 21 Pearson.

So **in(27/1/2019)** we decided to make a device that measured the amount of rain collected in the valley and measure the speed of the torrent formed

The valley stretches 11 km. knowing the velocity of the torrent, we can measure the time required for the flow of the stream down the valley and give a warning to the inhabitants of the downside of the valley and tell them the time required for the arrival of the torrent. With the help of this device people will prepare for the flush flood and will have time to take precautions.

So we manufactured the machine with the help of Zarqa Private University

Circuit Diagram:

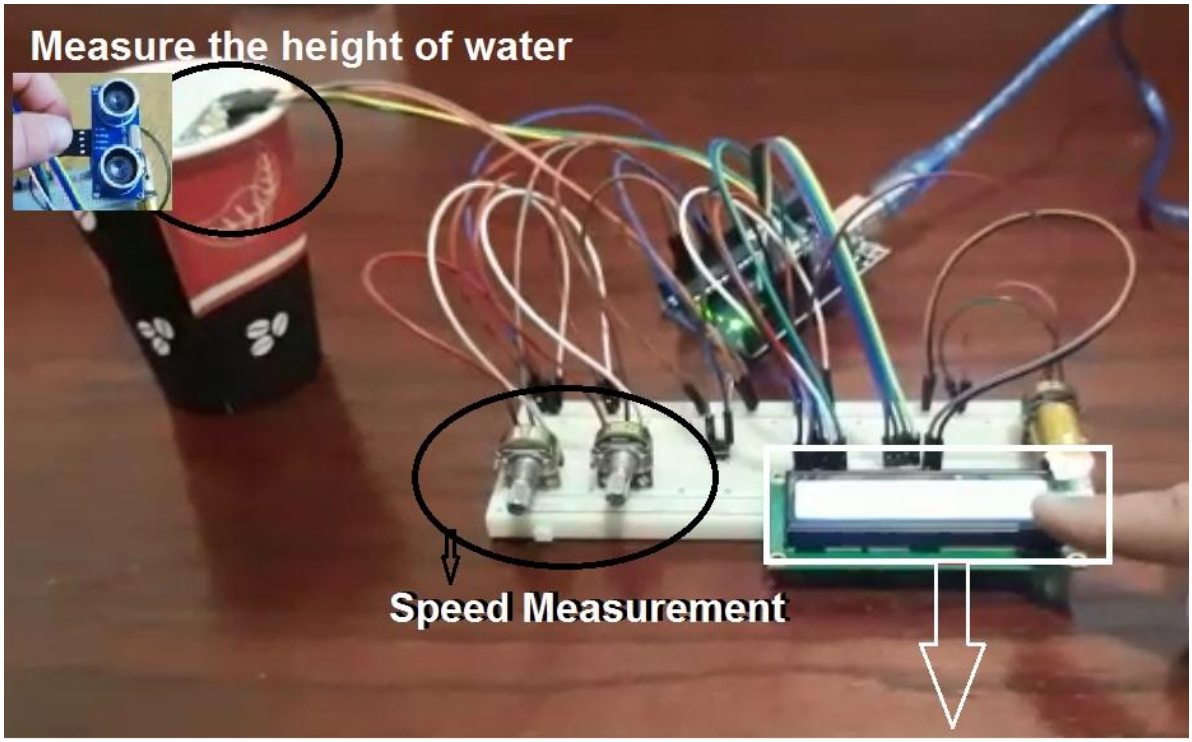


fig(2)Circuit Diagram of flash flood predictor

Main components:

We purchased the tools **on 2/2/2019**, and then started designing the project on **3/2/2019**; the computer department helped us in programming and inserting the geological data of the device.

Name	Purpose
Arduino Uno	Main Controller
16*2 LCD	Result monitor
breadboard	Connection environment
Ultrasonic Sensor	Level measuring sensor
potentiometer *2	Flow rate measuring part



A screen showing the speed of the torrent and the height of the water and the time remaining to reach the flush flood

Pic(9) flash flood predictor machine

Recommendations:

In the practical approach, we recommend the following

1- use more than one multi-interceptor potentiometer pair, to measure water speed continually.

2- The IPP construction must convey many constraints:

   1) The rotating vice torque must assure that only a water torrent could move it, not anything with less power

   2) Attach a motor for each IP, to accomplish the resetting operation.

3- Choose or create special conditions to employ the water-level measuring sensor appropriately

4- Install a warning alarm next to the screen, to activate the visual and audible alarm

5- Programmable countdown after determining the time that the flood takes to reach

6- Place another alarm screen in the middle of the valley 4 km away

7- It is possible to install a speaker system for what appears on the screen

References

1- **Geology of Jordan – Abdelqader Abed**
2- **Ministry of Water and Irrigation reports**
3- **GOOGLE EARTH program (give us pictures and elevation contour maps)**

Thank you ☺