J.B.BODA

EARTH

October 2023

- AI drones to help farmers optimize vegetable yields

- Flash floods occurred in the State of Sikkim, India

Read on to learn more.

J.B.BODA

EARTH

AI drones to help farmers optimize vegetable yields

For reasons of food security and economic incentive, farmers continuously seek to maximize their marketable crop yields. As plants grow inconsistently, at the time of harvesting, there will inevitably be variations in quality and size of individual crops. Finding the optimal time to harvest is therefore a priority for farmers. A new approach making heavy use of drones and artificial intelligence demonstrably improves this estimation by carefully and accurately analyzing individual crops to assess their likely growth characteristics.

Some optimistic science fiction stories talk about a post-scarcity future, where human needs are catered for and hard labor is provided by machines. There are some ways in which this vision appears to predict some elements of current technological progress. One such area is in agricultural research, where automation has been making an impact. For the first time, researchers, including those from the University of Tokyo, have demonstrated a largely automated system to improve crop yields, which can benefit many and may help pave the way for future systems that could one day harvest crops directly.

The idea is relatively simple, but the design, implementation and execution is extraordinarily complex. If farmers know the ideal time to harvest crop fields, they can reduce waste, which is good for them, for consumers and the environment. But optimum harvest times are not an easy thing to predict and ideally require detailed knowledge of each plant; such data would be cost and time prohibitive if people were employed to collect it. This is where the drones come in. Some low-cost drones with specialized software can image and analyze young plants and accurately predict their expected growth characteristics, broccoli in the case of this study. The drones carry out the imaging process multiple times and do so without human interaction, meaning the system requires little in terms of labor costs. According to the study, it might surprise some to know that by harvesting a field as little as a day before or after the optimal time could reduce the potential income of that field for the farmer by 3.7% to as much as 20.4%. But with this system, drones identify and catalog every plant in the field, and their imaging data feeds a model that uses deep learning to produce easy-to-understand visual data for farmers. Given the current relative low costs of drones and computers, a commercial version of this system should be within reach to many farmers.

J.B.BODA

EARTH

The main challenge the study faced was in the image analysis and deep learning aspects. Collecting the image data itself is relatively trivial, but given the way plants move in the wind and how the light changes with time and the seasons, the image data contains a lot of variation that machines often find hard to compensate for. So, when training the system, had to invest a huge amount of time labelling various aspects of images the drones might see, in order to help the system learn to correctly identify what it was seeing. The vast data throughput was also challenging - image data was often of the order of trillions of pixels, tens of thousands of times larger than even a high-end smartphone camera. But it is inspiring to find more ways that plant phenotyping (measuring of plant growth traits) can go from the lab to the field in order to help solve the major problems which the study is facing.

Source - https://www.sciencedaily.com

Flash floods occurred in the State of Sikkim, India

On Wednesday, October 4, 2023, the South Lhonak Lake - a glacial lake situated in the state's northwest at 17,000 ft (5,200 meter) - burst due to incessant rains, leading to the release of water in downstream areas. This caused the rise of water levels in Teesta River that flooded at least four districts, including Mangan, Gangtok, Pakyong and Namchi.

There was a sudden surge in water flow in the Teesta river, which washed away several bridges, parts of NH-10, the Chungthang Dam and has impacted several small villages, towns and infrastructure projects in the upper reaches of the river valley.

According to the National Disaster Management Authority (NDMA), a combination of excess rainfall and a Glacial Lake Outburst Flood (GLOF) event at South Lhonak Lake in North Sikkim could have triggered the flash floods.

Source: RauIAS

EARTH

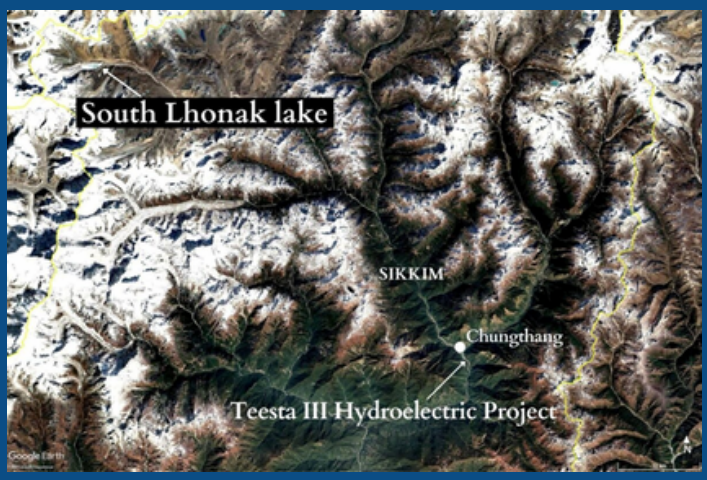
Damage

The flooding caused by the lake breach destroyed Sikkim's largest hydropower plant, the Teesta III Hydroelectric Project, located downstream.

Other Recent GLOF Incidents in India

- In February 2021, Chamoli district in Uttarakhand witnessed flash floods which are suspected to have been caused by GLOFs.
- In August 2014, a glacial lake outburst flood hit the village of Gia in Ladakh.

In June 2013, Uttarakhand had received an unusual amount of rainfall leading to the melting of the Chorabari glacier and the eruption of the Mandakini River.



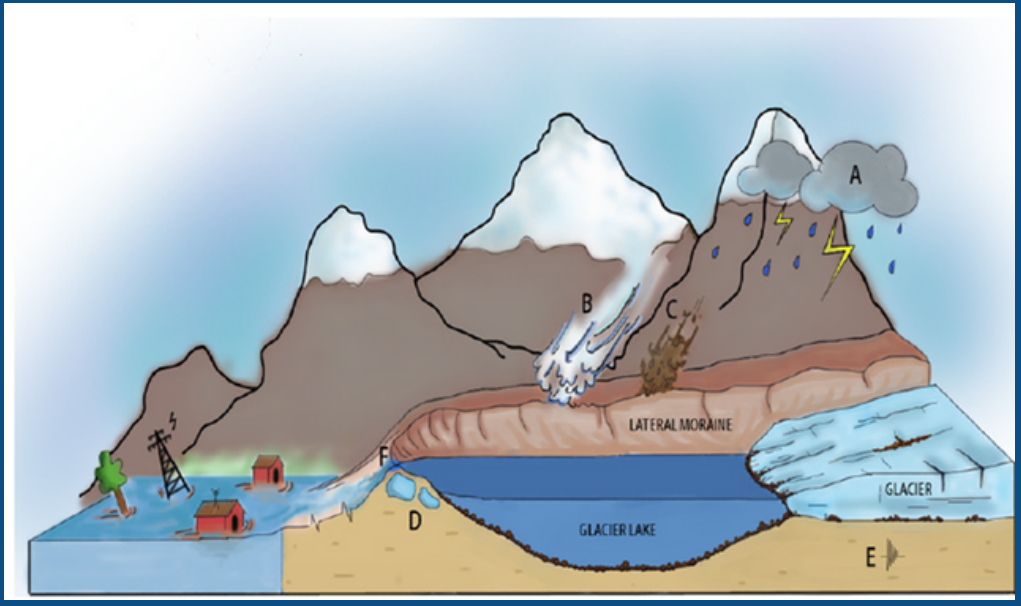
Source: Google Earth Pro, RauIAS

Construction vehicles covered in debris caused by flash floods after a lake burst in Rangpo, Sikkim | Source: Reuters

EARTH

What is Glacial Lake Outburst Flood (GLOF)?

A GLOF (Glacial Lake Outburst Flood) is a sudden and potentially catastrophic flood that occurs when water stored behind a glacier, or a moraine (a natural accumulation of ice, sand, pebbles, and debris) is released rapidly.



Graphic showing various reasons (A) Cloudburst (B) Snow avalanche (C) Landslide (D) Melting ice in moraine (E) Earthquake (F) Overflow | Source: RauIAS

These floods happen when glacial lakes formed by melting ice accumulate water behind weak moraine dams. Unlike sturdy earthen dams, these moraine dams can fail abruptly, releasing large volumes of water in minutes to days, leading to devastating downstream flooding.

The Himalayan terrain, with its steep mountains, is particularly vulnerable to GLOFs which can be triggered by several reasons, including earthquakes, extremely heavy rains and ice avalanches.

Climate change, accompanied by rising global temperatures, has sped up glacier melting in the Sikkim Himalayas. The region now boasts more than 300 glacial lakes, with ten identified as susceptible to outburst floods.

GLOFs can result in catastrophic downstream flooding. They have the potential to release millions of cubic meters of water in a short period of time. Peak flows during GLOFs have been recorded as high as 15,000 cubic meters per second.

EARTH

Economic Impact

According to initial estimate National Hydro Electric POWER Corporation (NHPC), the flash floods caused loss of INR 233.56 Crore (USD 28.05 Mln). All assets/works of Teesta-VI hydro-electric project are insured under the Construction All Risk (CAR) Policy, subject to excess clause and loss limit.

References:

- National Disaster Management Authority (NDMA)
- NHPC
- Indian Express
- Hindustan Times