COLLEGE CODE:9512

COLLEGE NAME:JP COLLEGE OF ENGINEERING

DEPARTMENT:ECE

PROJECT CODE:Proj_211933_Team_1

FLOOD MONITORING AND EARLY WARNING

PHASE -3
DEVELOPING PART 1

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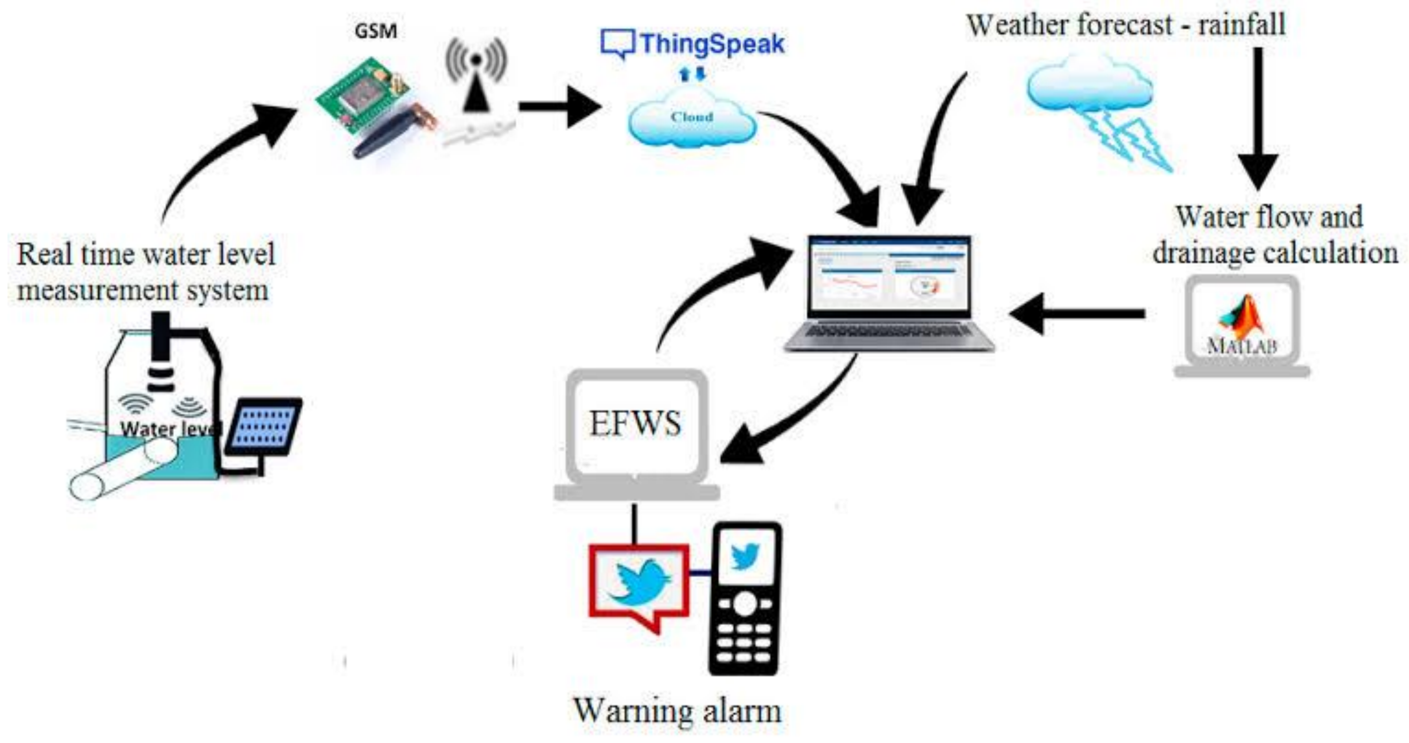
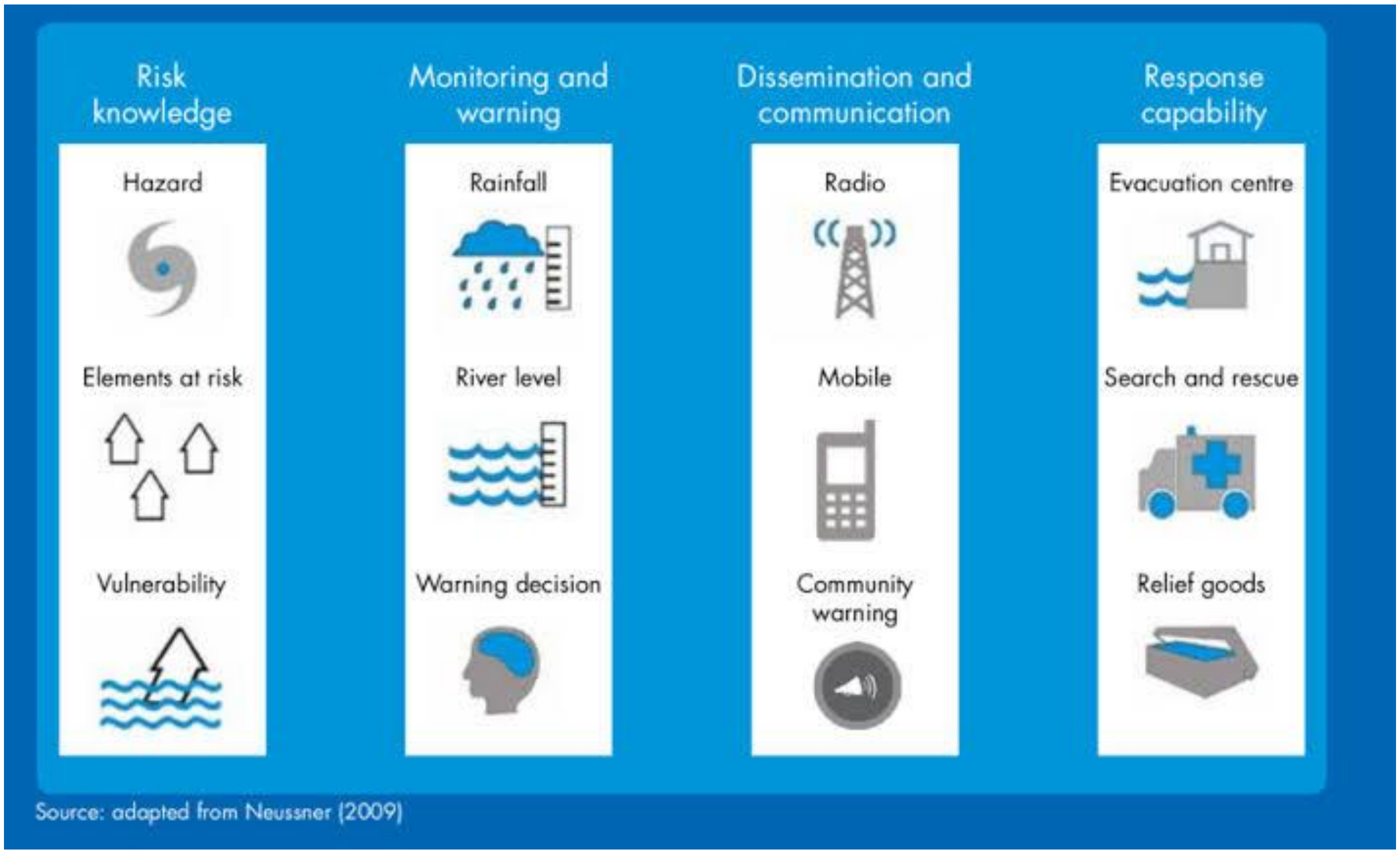
ABSTACT:

This paper discusses different Internet of Things (IoT) based techniques and applications implemented for efficient flood monitoring and an early warning system and it is observed that in future, the combination of IoT and Synthetic Aperture Radar (SAR) data may be helpful to develop robust and secure flood monitoring and early warning system that provides effective and efficient mapping during natural disasters. The emerging technology in the discipline of computing is IoT, an embedded system that enables devices to gather real-time data to further store it in the computational devices using Wireless Sensor Networks (WSN) for further processing. The IoT based projects that can help collect data from sensors are an added advantage for researchers to explore in providing better services to people. These systems can be integrated with cloud computing and analyzing platforms. Researchers recently have focused on mathematical modeling based flood prediction schemes rather than physical parametric based flood prediction. The new methodologies explore the algorithmic approaches. There have been many systems proposed based on analog technology to web-based and now using mobile applications. Further, alert systems have been designed using web-based applications that gather processed data by Arduino Uno Microcontroller which is received from ultrasonic and rain sensors. Additionally, the machine learning based embedded systems can measure different atmospheric conditions such as temperature, moisture, and rains to forecast floods by analyzing varying trends in climatic changes.

WORKING PRINCIPLE DIAGRAM:


GSM
ThingSpeak
Cloud
Weather forecast - rainfall
Water flow and drainage calculation
MATLAB
Real time water level measurement system
Water level
EFWS
Warning alarm

KEY ELEMENT:



Creating a flood monitoring and early warning Python program is a complex task that involves various components, including data acquisition, analysis, and notification systems. Here's a

simplified outline of the steps you can follow to get started:

Data Acquisition:

Obtain real-time or historical data related to rainfall, water levels, weather forecasts, and river flow rates from reliable sources or APIs.

Data Processing:

Process and clean the acquired data to ensure accuracy and consistency.

Threshold Setting:

Define critical thresholds for rainfall and river levels that could trigger flood warnings.

Early Warning Logic:

Implement the logic to evaluate the current data against the predefined thresholds.If thresholds are exceeded, trigger a warning.

Notification System:

Integrate a notification system to alert relevant authorities and the public. You can use email, SMS, or other communication channels.

Visualization:

Create visualizations such as charts and maps to display real-time data and warnings.

Database:

Store historical data for analysis and future reference.

User Interface (Optional):

. Develop a user interface for users to view data and warnings.

Here's a simple example of Python code for flood monitoring and early warning:

```
import random

def acquire_data():

    # Simulate data acquisition, replace with actual data retrieval code

    return {

        "rainfall": random.uniform(0, 50),

        "river_level": random.uniform(0, 10)

    }


def check_for_flood(data, thresholds):

    if data["rainfall"] > thresholds["rainfall"] or data["river_level"] > thresholds["river_level"]:

        return True

    return False


def send_notification():

    # Implement your notification logic here

    print("Flood Warning: Take necessary precautions!")
```

```
if __name__ == "__main__":

    thresholds = {

        "rainfall": 30,  # Example rainfall threshold in mm

        "river_level": 7  # Example river level threshold in meters

    }



    while True:

        data = acquire_data()

        if check_for_flood(data, thresholds):

            send_notification()
```

Remember that a real flood monitoring system should be much more sophisticated, including reliable data sources, extensive error handling, and a more comprehensive notification system. Additionally, ensure you have the necessary permissions and consider legal and ethical considerations when implementing such a system.

Writing the code in Python IDE.

```
# OpenCV packages for Python
import cv2
# Python plotting package
```

```
import matplotlib.pyplot as plt
# Fork of argparse to add features and simplify its
code
import argparse
# functions to make basic image processing functions
import imutils
# this for add math function
import math
import time
# package for array computing with Python
import pandas as pd
from numpy import asarray as pn
from sklearn.linear_model import LinearRegression
from imutils.perspective import four_point_transform
from imutils import paths
from sklearn.metrics import mean_squared_error

# capture frames from a camera
cap = cv2.VideoCapture(0)

cap.set(3, 640)
cap.set(4, 480)
count = 0
height = []

flag = 0

# reads frames from a camera
ret, frame = cap.read()
cv2.imwrite("testimage.jpg", frame)
im = cv2.imread("testimage.jpg")

r = cv2.selectROI(img=im, windowName="test")

t = time.localtime()
current_time = time.strftime("%H:%M:%S", t)
```

```
# loop runs if capturing has been initialized
while (1):

    ret, frame = cap.read()

    if frame is None:
        break

    # Crop image
    frame = frame[int(r[1]):int(r[1] + r[3]),
int(r[0]):int(r[0] + r[2])]
    # Convert the img to grayscale
    gray = cv2.cvtColor(frame, cv2.COLOR_BGR2HSV)
    # Apply edge detection method on the image
    edges = cv2.Canny(gray, 100, 120)
    # Run Hough on edge detected image
    lines = cv2.HoughLinesP(edges, 1, math.pi/180, 20,
None, 20, 480)
    dot1 = (lines[0][0][0], lines[0][0][1])
    dot2 = (lines[0][0][2], lines[0][0][3])
    slope = ((lines[0][0][3] -
lines[0][0][1])/(lines[0][0][2] - lines[0][0][0]))
    #cv2.line draws a line in img from dot1 to dot2
    # (255,0,0) denotes the colour of the line to be
drawn
    if 0 <= slope <= 0.15:
        cv2.line(frame, dot1, dot2, (255, 0, 0), 3)
        length = 150 - lines[0][0][3]
        print(length)
        height.append(length)

        cv2.imshow("Detected Line", frame)
        # finds edges in the input video and
        # marks them in the output map edges
        edged_frame = cv2.Canny(frame, 1, 100)
        cv2.imshow('Edged Frame', edged_frame)

    if cv2.waitKey(1) & 0xFF == ord('q'):
        break

x = []
y = []
file = open("Saved.txt","a")
for i in range(len(height)):
     x.append(i)
     y.append(height[i])
     file.write(str(x[i-1])+","+str(y[i-1])+"\n")

X=np(x)
Y=np(y)

X = X.reshape(len(X),1)
Y = Y.reshape(len(Y),1)

model = LinearRegression()
model.fit(X,Y)

model = LinearRegression().fit(X,Y)
r_sq = model.score(X,Y)

y_pred = model.predict(X)
y_pred = model.intercept_+ model.coef_*X

print('Predicted Response:', y_pred, sep='\n')
print('Start :', current_time)
print('Coefficient of Determination:', r_sq)
print('Intercept:', model.intercept_)

accuracy = mean_squared_error(y, y_pred)
print('Accuracy :', accuracy)
```

```
t = time.localtime()
current_time2 = time.strftime("%H:%M:%S", t)
print('Stop  :', current_time2)

plt.plot(X,Y,'.',color='black')


cap.release()
cv2.destroyAllWindows()

plt.plot(X,y_pred)

plt.title('Test Data')
plt.xlabel('Time')
plt.ylabel('Height')
plt.show()
```

THE END