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Early Flood Detection and Avoidance using IoT

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Abstract: Flooding is typically brought on by an increased quantity of water during a water system, sort of a lake, river overflowing. On occasion a dam fractures, abruptly releasing a huge quantity of water. The outcome is that a number of the water travels into soil, and 'flooding' the region. Rivers are involving river banks, in a station. Aside from lack of products and house and office property, streets infrastructure flood water consists of bacteria and sewage flow of waste sites and chemical spillage which results in a variety of diseases afterwards.

Flood predictions need information like: The speed of change in river stage on a realtime basis, which can help indicate the seriousness and immediacy of this threat. Understanding the form of storm generating the moisture, such as length, intensity and a real extent, which is valuable for discovering potential seriousness of the flood. In this system we make use of a Arduino Uno interfaced with 4 different sensors, named as Ultrasonic sensor for measuring water levels, float sensor detect full water, Flow sensor for knowing speed of water and humidity sensor. These combinations of sensor are used to predict flood and alert respective authorities with help of IOT and sound instant alarm in nearby villages to instantly transmit information about possible floods. These sensors provide information over the IOT using Wifi module. On detection of conditions of flooding the system predicts the quantity of your time it might take to arrive a specific area and alerts the villages/areas that would be affected by it. The system also calculates the time it might deem flood to succeed in them and provides a time to people in order that they will evacuate accordingly.

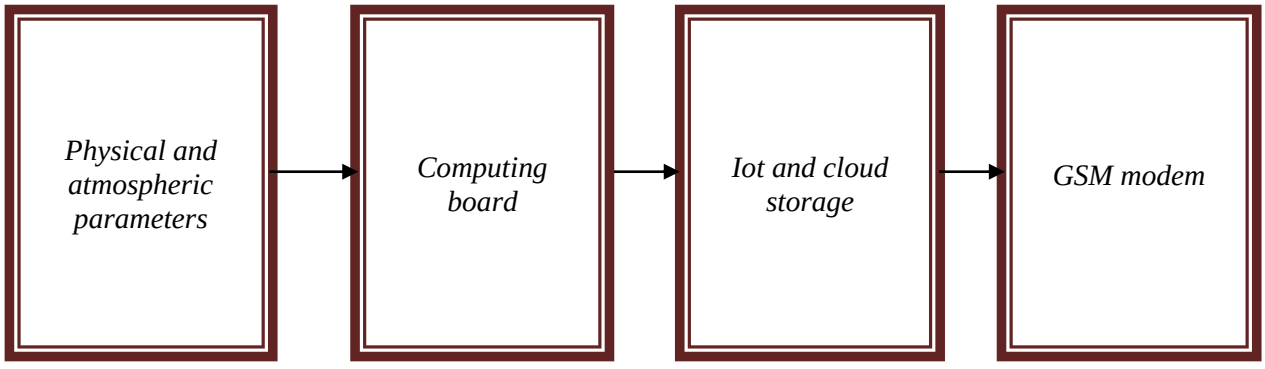
Keywords: Flood Detection, IOT, Sensors, Arduino, GSM Module

I. INTRODUCTION

Iot early flood detection and avoidance is an system which is used to detect the occurance of a flood. We are doing this by measuring various such as humidity, temperature, water flow, level of water in dam etc.The sensors in the module detects these parameters continuously and takes action immediately based on the results. In case the values shoots over the predefined threshold, this module triggers and alert system. The raw data is transferred over the iot which can be used to fine tune the system and hence increase the accuracy of the module. We are using DHT11 sensor which detects the humidity and temperature, HCSR04 measures object distance using ultra sonic ranging. All these sensors are connected to the arduino uno which does the necessary computation.

II. SYSTEM ARCHITECTURE

This is a sophisticated system which is employed to detect floods and update the status over internet.



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Most of the water bodies are often easily accessed by the people, and at time disaster may happen that the seas become violent and sometimes it could end in flooding and lives are often lost within the process. therefore the proposed system detects the changes within the weather and water level so on inform the authority about the danger.

The system is powered by 230v ac supply. to make sure that the provision power is maintained within the desired value, regulator circuit is employed . the important component of the system is that the arduino uno which works as the CPU board for the system. The arduino uno is coded with appropriate programing language in such a way that, it's readily available to gather the varied data the sensor provide and to process these data in order generate a meaningful result. There are five sorts of sensor utilized in the system, which measures various atmospheric and physical parameters. Firstly the ultrasonic sensor measures the extent of water within the dam or flood occurring areas. The flow level sensor is employed to measure the flow of water just in case the dam or the water bodies overflows due to excessive rain fall or other calamities. The temperature and also the humidity sensor is employed to sense the atmospheric temperature and the humidity as these two parameters also play a serious role in predicting the occurrence of flood. The float sensor is employed to point if the water flows above the edge limit. These data after being processed are transferred wirelessly through wifi module to the iot database, where these data are stored which may be accustomed fine tune the system. These data are constantly updated with a time dilation of 250ms. An alert system is triggered as soon the values shoots above the edge values. An GSM module is employed to send an alert signal in the form of text message (SMS) to the encircling people during the condition of flood.

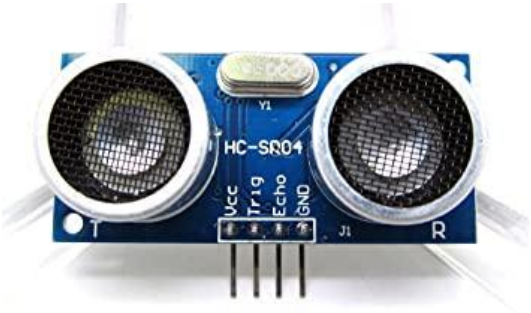
III. DESIGN AND IMPLEMENTATION

The flood alert system is partitioned into five different parameters: the input to the system given by ultrasonic sensor, flow sensor, float sensor and temperature and humidity sensor. These data are processed with the help of arduino uno controller. The output of the module is given by a high frequency alarm and a system generated alert SMS with the help of GSM modem. Block diagram of the main system can be seen in the Figure 1.

A. Ultrasonic Sensor

Ultrasonic sensor that functions by emitting a low frequency wave, inaudible to the human ears. These waves after being reflected by the zero point reaches back to the ultrasonic sensor, the time it takes while being reflected by the surface is calculated. This method facilitates as a very low cost and easy method for measuring distance. This sensor is most suitable for many applications where distance is to be measured between moving objects or still objects. The signal waves transmitted by ultrasonic sensor has a frequency of 40 kHz. The signal that is transmitted will propagate as a noise wave with velocity of 340m/s. Then the noise wave gets reflected ultrasonic sensor. After th signal acquired by the receiver, the wave is progressed to calculate the distance. The formula used to calculate distance is: $S = 340.t/2$, where S is distance between emitted and reflected wave and t is the time between them. The next pulse wave is transmitted when the echo of the current noise wave is vanished. This time period is known as cycle period. The most recommended cycle period must be not less than 50ms.

The ultrasonic sensor selection is based on two condition: first, maximum measuring distance of ultrasonic and second the measuring angle of ultrasonic sensor. Based on the data form various types of ultrasonic sensor it was decided that ultrasonic HC-SR04 was most suitable.



In our system, all the senor values are computed by Arduino uno controller. The ultrasonic sensor is placed above the tank horizontally in such a way that sensor is facing the water directly. The tank contains water whose distance is to be measured. The design of the system can be seen in the Figure 2.

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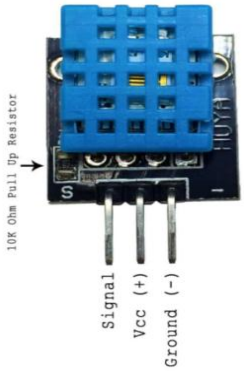
B. Temperature and Humidity sensor

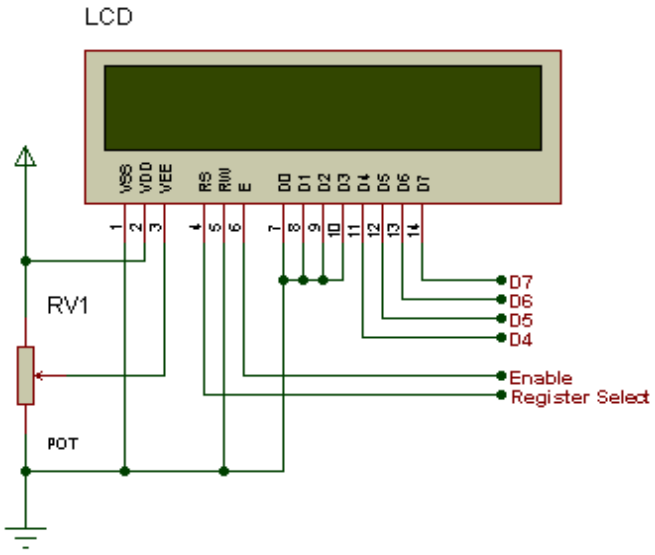
The temperature and humidity sensor DHT11 comes with a single row 4 pin package and operates on 3.5 to 5.5 v supply. It can measure temperature which ranges from 0 to 50°C with accuracy of ±2°C. This sensor gives fully calibrated digital outputs for the associated measurements. It has proprietary 1 wire protocol, hence the communication between the sensor and arduino microcontroller doesn't happens via a direct interface with any of its peripherals. The protocol has to be executed in a firmware of the MCU with precise timing required by the sensor.



The below timing diagram helps us in understanding date transfer protocol which happens in between MCU and the DHT11 sensor. The date transmission is initiated by MCU using "Start" signal. The MCU pin should be configured as output for this purpose. The MCU keeps the data line low for at least 18 milliseconds and then changed to high for the next 20 to 40s. And then the sensors responds to the command "Start" signal by turning line low for 80s followed by a logic high signal that lasts for another 80s. The MCU pin must be configured to input after finishing the "Start" signal. After detecting the response signal form the sensor, the MCU must be ready to receive data from the sensor. Then sensor sends 40bytes of data continuously in the data line.

C. Liquid Crystal Display(LCD)

The 44780 standard has 3 control lines and either 4 or 8 I/O lines for the data bus. The user has the freedom to select whether the LCD has to operate with a 4 bit data bus or 8 bit data bus. In 4 bit data bus LCD requires a total of 7 data lines in which there is 3 control lines and 4 lines for the data bus. In 8 bit data bus LCD requires a total of 11 data lines in which there is 3 control lines and 8 lines for the data bus.



The three control lines referred here are EN, RS, and RW.

The EN line stands for "Enable". This control line is used to initiate the process of sending data. To send date in LCD, the program must make sure that line is low (0) and then set the other control lines or put data on the data bus. When all other lines are ready, set EN high (1) & wait for the time required by the LCD and finally end it by bringing it low (0).

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The RS lines refers to “Register Select”. When this line is low (0) the data is treated as command or special instruction. When this line is high (1), that data being transmitted is text data which must be displayed on the screen.

The RW line refers to “Read/Write”. When this line is low (0), the information on the data bus is written to the LCD. When this line is high (1), the program is reading the LCD. The instruction “Get LCD Status” is a read command. All other commands are write commands.

D. Water flow sensor

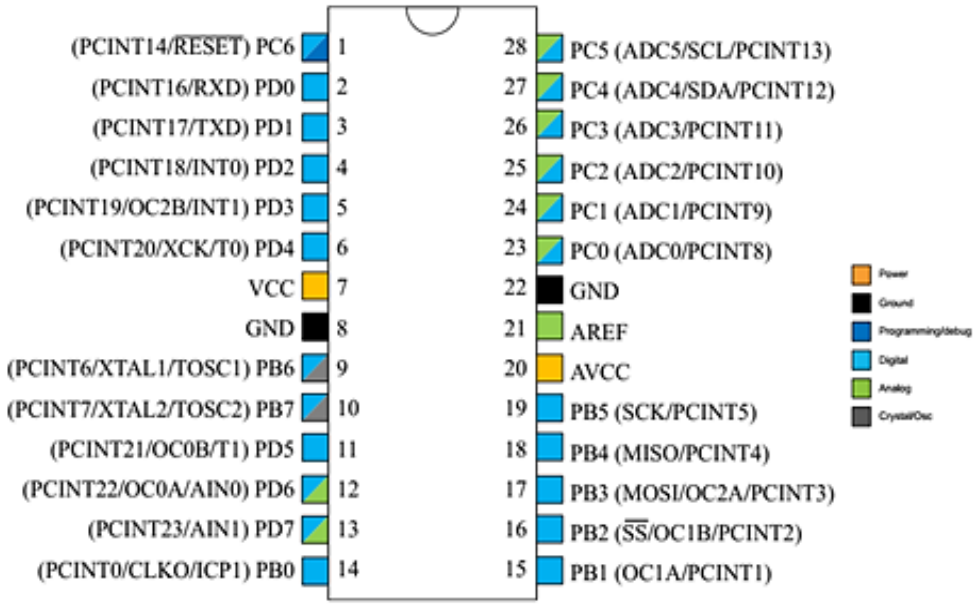
This sensor is made of a plastic valve through which water passes. A rotor and a hall effect sensor is used to sense and measure the flow of water. When water flows the rotor starts rotating. Due to this, a change in speed is observed in the motor This change in speed is calculated as a pulse signal by the hall effect sensor. In this manner the flow of water is measured.

According to hall effect principle, in the sensor, a voltage difference is produced in the conductor as the rotor rotates. This motion induces a voltage difference which in turn produces electric current. This sensor is interfaced with arduino. This sensor consists of three leads. Red lead is connected to supply voltage, black lead is connected to ground and the yellow lead is used to collect output from

Hall effect sensor. The supply voltage given is 5v to 18v of dc. It has flow rate range of 1-30L/min with a load capacity of 10mA. The operating humidity is 35%-90%RH and this sensor can handle a pressure of 1.5 MPa.

E. Arduino Uno and microcontroller ATmega328P

Arduino Uno is an open source microcontroller platform which is based on ATmega328P microcontroller. The arduino board is assembled with digital and analog input and output (I/O) pins. It consists of total 14 digital pins for I/O operations and 6 analog pins for programming the ardunio with the help of ardunio IDE. The board is powered by 9v battery, though it can sufficiently work on 7v to 20v.



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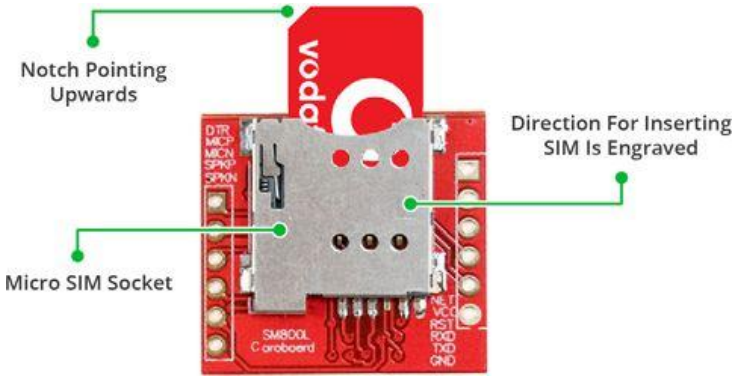
ATmega328P is an high performance 8 bit AVR RISC based microcontroller, it has 32kb ISP flash memory, with read-while-write functionality. There are 23 GPIO,32 general purpose working registers, three timer/counters, internal interrupts and external interrupts, serial programmable USART. This device operates between 1.8-5.5 volts.

The data from the sensor are collected in this board. With the help of sketch written in Ardunio IDE, these data are interrupted and a meaningful end value is generated.

F. GSM Modem

A GSM module is an unique type of modem which uses a SIM card and functions as a mobile operator. GSM module is just like a smart phone which is often used to receive and transmit SMS (Short Message Service). The GSM module used is SIM 800L.

The operating voltage ofthe chio is from 3.4- 4.4v, which makes it an perfect moduel for direct LiPo batter supply. It supports a baud rate frim 1200bps to 115200bps. This module needs an external antenna in order to establish connection with network hence, it comes with Helical Antenna which is soldered directly to NET pin on PCB.



The module uses LED to indicate the status of the network. The LED blinks at different rate to indicate what status it is running in, if the module is blinking every 1s then the module hasn't made connection to the cellular network yet. If the module blinks every 2s, then the module has successfully activated the GPRS date connection you requested for. If the module blinks every 3s, then the module has made contact with the network and it is now ready to send or receive voice and SMS.

Modes	Frequency	Current Consumption
Power down		60 uA
Sleep mode		1 mA
Stand by		18 nA
	GSM 850	199 mA
Call	EGSM900	216 mA
	DCS1800	146 mA
	PCS1900	131 mA
GPRS		453 mA
Transmission burst		2 A

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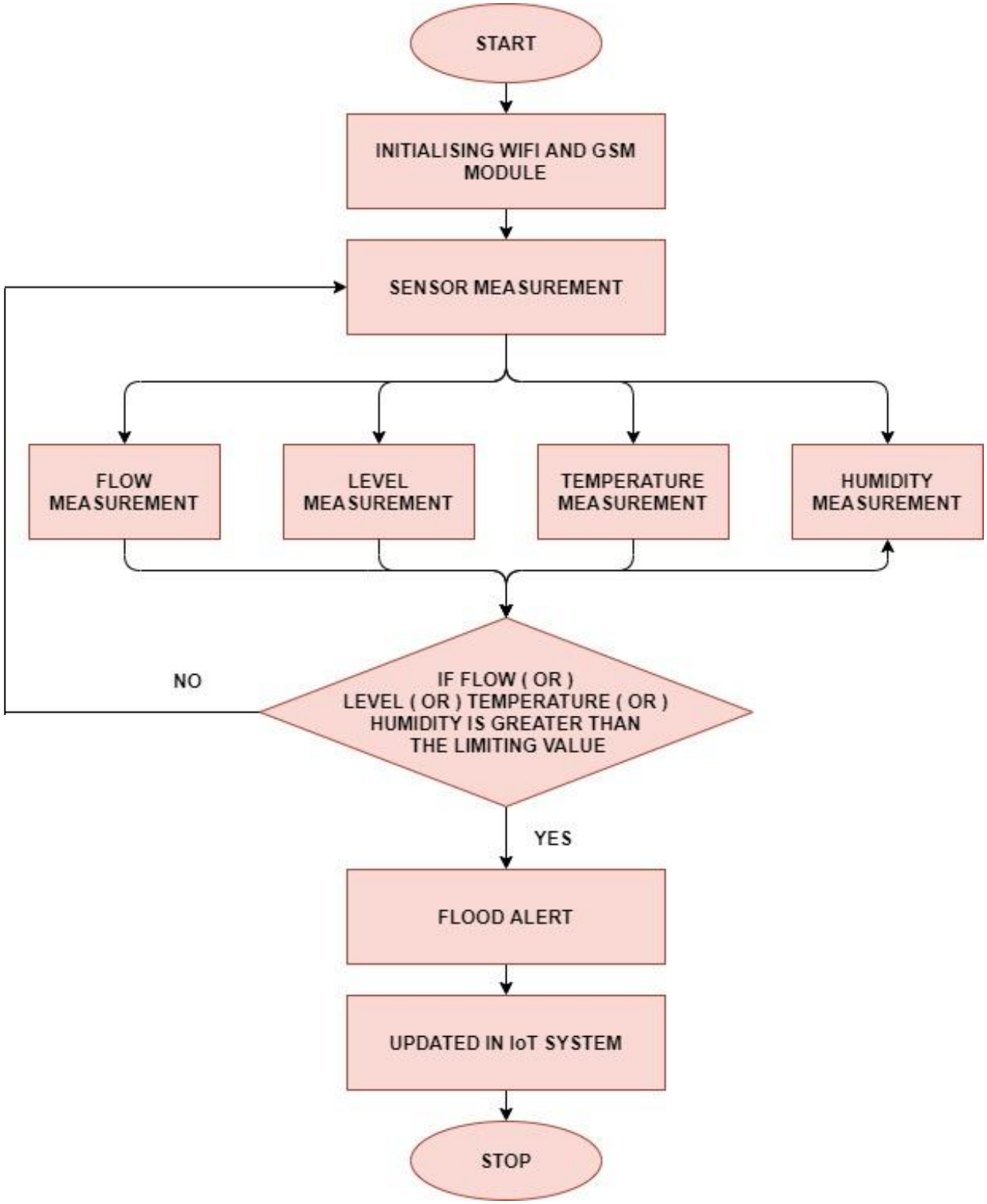
IV. SOFTWARE IMPLEMENTATION



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V. EXPERIMENTAL OBSERVATION

By employing this real time alert system it will be very convient to spread awareness to the public prior to the flood occurrence. The data from the various sensor are processed to reveal the probability of flood occurance. As these parameters namely; temperature, humidity, water flow and speed of water flow are very important in prediction. Any sudden changes in these parameter or any unusual curve in the data will trigger the alert system. In the alert system and a very high frequency buzzer is raised and a system generated alert message is sent to the public. This system also stores these data in the cloud so as to train this system in an much efficient manner.

VI. CONCLUSION

In our project we have developed a module for provide first case prevention in case of flood. This system uses ardiuno uno along with couple of other sensors such as DHT11, ESP8266 etcetra to achieve the desired output. This module generates an alert signal which is transferred wirelessly to the concerned authorities. The date collected is stored in the database for future references.

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Without proper guidance and encouragement, successful completion of any task will be impossible. We are honoured to present the project which is the result of our knowledge. Our Respected general **Mr.AS Sai Nishhok Krishnaa**, Department of Instrumentation and Control Engineering, by his constant support, this has been achieved. Finally, we are grateful for enriched cooperation and suggestions.

REFERENCES

[1]. S. M. Metev and V. P. Veiko, Laser Assisted Microtechnology, 2nd ed., R. M. Osgood, Jr., Ed. Berlin, Germany: Springer-Verlag, 1998.
[2]. J. Breckling, Ed., The Analysis of Directional Time Series: Applications to Wind Speed and Direction, ser. Lecture Notes in Statistics. Berlin, Germany: Springer, 1989, vol. 61.
[3]. S. Zhang, C. Zhu, J. K. O. Sin, and P. K. T. Mok, "A novel ultrathin elevated channel low-temperature poly-Si TFT," IEEE Electron Device Lett., vol. 20, pp. 569–571, Nov. 1999.
[4]. M. Wegmuller, J. P. von der Weid, P. Oberson, and N. Gisin, "High resolution fiber distributed measurements with coherent OFDR," in Proc. ECOC'00, 2000, paper 11.3.4, p. 109.
[5]. R. E. Sorace, V. S. Reinhardt, and S. A. Vaughn, "High-speed digital-to-RF converter," U.S. Patent 5 668 842, Sept. 16, 1997.
[6]. (2002) The IEEE website. [Online]. Available: http://www.ieee.org/
[7]. M. Shell. (2002) IEEEtran homepage on CTAN. [Online]. Available: http://www.ctan.org/tex-archive/macros/latex/ contrib. /supported/IEEEtran/
[8]. FLEXChip Signal Processor (MC68175/D), Motorola, 1996.
[9]. "PDCA12-70 data sheet," Opto Speed SA, Mezzovico, Switzerland.
[10]. A. Karnik, "Performance of TCP congestion control with rate feedback: TCP/ABR and rate adaptive TCP/IP," M. Eng. thesis, Indian Institute of Science, Bangalore, India, Jan. 1999.
[11]. J. Padhye, V. Firoiu, and D. Towsley, "A stochastic model of TCP Reno congestion avoidance and control," Univ. of Massachusetts, Amherst, MA, CMPSCI Tech. Rep. 99-02, 1999.
[12]. Wireless LAN Medium Access Control (MAC) and Physical Layer(PHY) Specification, IEEE Std. 802.11, 1997.