Farm-Assist

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Abstract— IOT is a system of inter-related computing devices, objects, animals or people which are provided with unique identifiers and the ability to transfer data over a network without requiring any human interactions. IOT plays an important role in agriculture. In this effort, a system is developed to monitor the crop field by using various sensors (Soil Moisture Sensor-This sensor provides real time dryness of soil and this data directly shows in our application. The main function of this sensor in our project is water pump is automatically control by this sensor. DTH11 Sensor – used for sensing the temperature and humidity in environment and provide sensor data to application via think-speak cloud computing. Rain Sensor – using this sensor, circuit will be protected from rain. PIR Sensor – this sensor is used mainly for cattle detection). All the sensors data are managed by thing-speak cloud computing and the system will be able to access the internet service using Wi-Fi module. The notifications will be sent to farmers mobile there which they can be able to monitor the field at very ease.

Keywords: Soil Moisture, Cattle detection, Hardware interface of Water pump, IOT, DTH11 Sensor

I. INTRODUCTION

Agriculture is one of the major sectors of Indian Economy. It is present in the country for thousands of years. Over years, it has developed and the usages of new technologies and equipment's have been replaced almost all traditional methods. Besides in India, there are still farmers that use the old traditional methods as they lack the use of resources to use the new one. India's major source of income is from agriculture sector and 75% of farmers and general people depend in agriculture.Our system is a smart and intelligent agriculture system which can help the farmer to utilize the water level sensibly and also take care of other discrepancy factors like unnecessary animal entry into the fields are discussed. Our system aims at making use of evolving technology i.e. IOT and smart agriculture using automation. Monitoring environmental conditions is the major factor to improve yield of the efficient crops.

The feature of our system includes development of a system which can monitor temperature, humidity, moisture and even the movement of animals which may destroy the crops in agricultural field through sensors using Arduino board and in case of any discrepancy send a notification on the application developed for the same to the farmer's smart phone using Wi-Fi/3G/4G[3]. The system consists of a microcontroller and sensors like moisture, temperature, humidity, motion etc. but not limited to only these. The system uses both wired and wireless connections for the communication between the sensors, microcontroller and the internet using ESP8266 WIFI Module. The system also consists of an android application which allows the user to give his/her input based on which the sprinkling will be controlled manually as well as automatically [6]. Also provide rain detection sensor for circuit protection when rain detect automatically turn ON/OFF according to rain. Our system is also consisting of weather analysis, automated irrigation and detection of cattle. There exists a demand for colossal technical knowledge to make irrigation systems more efficient [6].

Automation irrigation system observes the moisture sensors and temperature variations of around the crop area that gives a precise time of operation, the motor turn ON and OFF. So, the automatic human avoid the human errors and check soil moisture level [8, 9]. Also considering the availability of water throughout India, it is one of the valuable resources to protect and save for future requirements. Embedded base automatic irrigation system is suitable for farmers are available at low cost for easy-installment [7]. These are some methods that have been used so far to improve irrigation system and increase crop productivity. In this work the system is developed using sensors to monitor crop-field and automate semi-irrigation system. The system is tested and gave good results. The wireless transmission of sensor data from field to the coordinator, storing it in a cloud, controlling field from mobile application or PC and irrigation control are worked very well. The water usage is 90% more efficient than any other traditional and other modern irrigation results.

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A. Background:

Rajalakshmi. P, etc. all [1] has given a concept of building IOT based crop field monitoring & irrigation automation in farming. Through this, farmer will be able to monitor the field. Condition from anywhere and the notification will be sent to the farmer's mobile periodically, which will be more useful to the areas where the water is in scarce. Nikesh Gondchawar, etc. all [2] showed a system of smart agriculture which will be based on IOT. The main objective of this system is to develop the agriculture smart by using advantages of technologies like Arduino, IOT, sensors, etc. Karan Kansara, etc. all [3] focuses on to assist the growing of agricultural of landscapes. Due to this, the farmer will be saving memory, time & power. In this, the field will be equipped with wireless a sensor that avoid better sensor communication and covers much more wider area. H.T.Ingale, etc. all [4] demonstrates an economical and easy way to use Arduino based controlled irrigation system based on GSM. Provides new technologies to the farmer to improve their way of farming, which will help them to save their time, so as to avoid as much as human interaction.

The aim of this paper reveals to decrease hardship of farmer by automating some processes in farm partially and making their daily life work at very ease. The Main purpose of our project is to help Farmer to manage their farms in convenient ways for their daily work without much need of Human interaction. The papers organize as Introduction, Hardware description, and system design, Results & discussions followed by Conclusions.

II. HARDWARE DESCRIPTION

A. Arduino MEGA 2560:

The Arduino Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Mega 2560 board is compatible with most shields designed for the Uno.

Fig. 1: ARDUINO MEGA 2560

B. ESP8266 Wi-Fi Module:

The ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor.

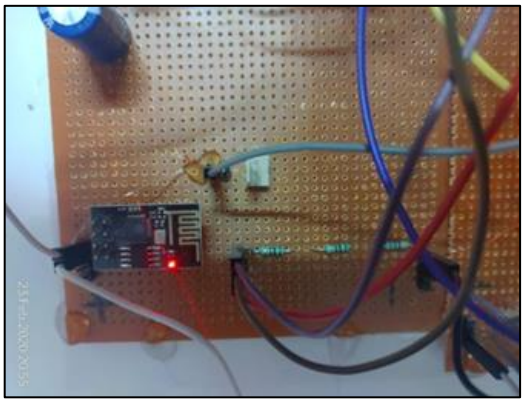

Fig. 2: ESP8266 Module

C. DTH 11 Sensor:

DHT 11 Sensor is sensing a temperature and humidity in environment and providessensor data to application via thinkspeak cloud computing. This sensorsenses real time data and shows in our applications.The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air.

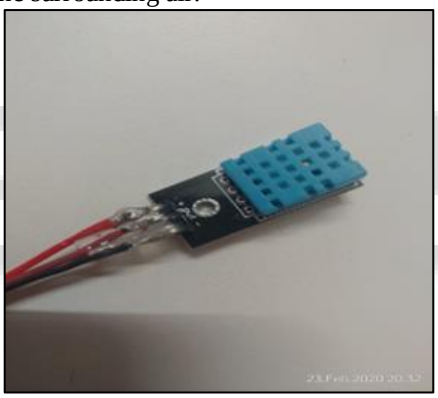

Fig. 3: DTH11 Sensor

D. Soil Moisture Sensor:

A soil moisture sensor measures the quantity of water contained in a material, such as soil.This sensor provides real time dryness of soil and this data directly shows in our application. A main function of the soil moisture sensor in our project is water pump is automatically control by this sensor.

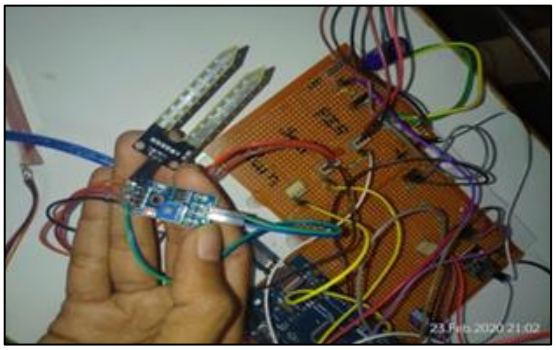

Fig. 4: Soil moisture sensor

E. PIR Sensor:

PIR sensors are commonly called simply "PIR", or "passive infrared detector". This Sensor is used for Cattle Detection. When any animal enter into the field, this sensor sense the motion around 10m circle.PIR sensors are commonly used in security alarms and automatic lighting applications.

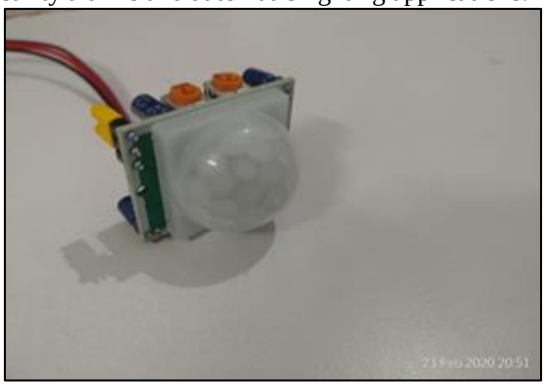

Fig. 5: PIR Sensor

F. Rain Sensor:

Purpose of using this sensor is circuit protection from Rain. When rain is detected all sensors and all external circuit are automatically OFF when rain stops all the sensors and circuits are automatically ON according to rain sensor.A rain sensor or rain switch is a switching device activated by rainfall.

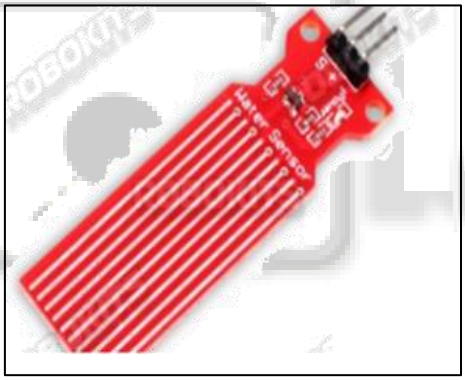

Fig. 6: Rain Sensor

G. Software used:

1) Thingspeak:

ThingSpeak is an IoT analytics platform service that allows you to aggregate, visualize and analyze live data streams in the cloud. ThingSpeak is often used for prototyping and proof of concept IoT systems that require analytics.

2) Flutter Studio:

Built for Android to accelerate the development and help you build the highest-quality apps for every Android device.Mainly used for designing the web applications, etc.

3) Arduino IDE:

It is a cross-platform application for Windows that is written in functions from C and C++ which is used to write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards.

III. CIRCUIT DIAGRAM DESCRIPTION

A. Circuit Diagram:

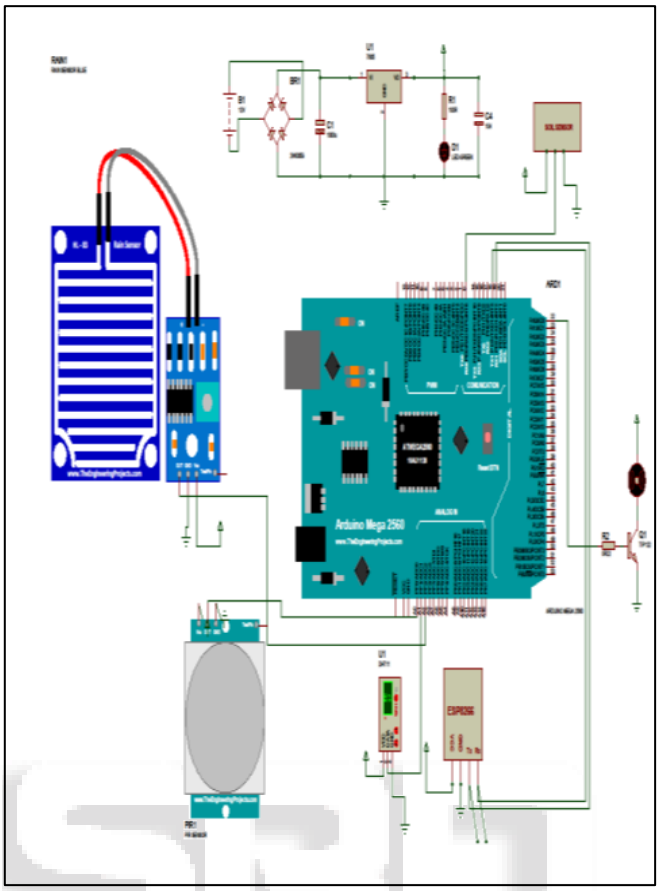

Fig. 7: Circuit diagram

First the connection will be established between the system and thingspeak cloud computing. All the sensors data will be managed by thingspeak cloud computing and all the system and the cloud computing are connected with an unique API key. This key can be able to access all the sensor's to store the data in cloud computing and this cloud will be able to show the real-time sensor's data and will be updated every 15 seconds. This system will be accessing internet connection using Wi-Fi module. The user's phone (or smart-phone) should be having an internet connection from which he/she can be able to access the application. For knowing the current or approximate status of weather, it is very necessary for the farmer to know and for that DTH11 sensor is used. Through this sensor, it will be able to sense the temperature and humidity in environment and provide sensors data to application via thingspeak cloud computing. . This sensor will be sensing real-time data and will be shown in our application. Next for knowing the current status of soil we have interfaced the soil moisture sensor with Arduino. This will be helping to provide real-time dryness of soil and this data will be directly shown in our application. The main function of this sensor in our system is water pump which will be automatically controlled by this sensor. It will be able to sense the data from sensor and provide the dryness of the soil and the logic will be set according to the dryness and the water pump will be automatically ON/OFF according to the dryness. When the water pump is in ON condition, it will measure the dryness

of soil and when it will be less than 30%, the water pump will be automatically turned OF Status of the rain will be known by interfacing rain sensor with Arduino. Main purpose of this sensor is to protect the circuit from rain. When the rain is been detected by the sensor, all external circuits will be turned OFF and vice-versa.Further if any cow /animal enter into the field, this sensor will sense around 10 meter (in a semi-circle manner) and when it detects any movement in field. This sensor will send signal to the buzzer, siren will be turned ON, and when it goes out, the siren will automatically OFF after 15 seconds. This sensor will detect only live thing. For knowing the water coming in field, we have interfaced the water pump with Arduino Board. Two capacitors is also placed with water pump because of its heavy noise and all this system is terminated at that time and the water pump will be operated by the application manually. And this mode is been provided by user only in the critical situation where the pump will not be getting ON/OFF automatically.

IV. RESULTS AND DISCUSSIONS

The designed hardware proto kit as shown in Fig:7 The real time results as shown in the fig. and the status of the system has taken on 4G mobile system shown in the Fig:8. The data obtain from sensors are stored in the cloud and can be monitored by farmer through his mobile/ PC. We provide a different module in our system such as multi language support, farmers login, through which we can access the farmers to manage their profile by giving unique user Id for particular farmer based on their unique API key, so that only the field owner can access one application. Output for knowing the exact temperature is shown in fig:9 and for humidity is shown in fig:10 for knowing the current soil moisture output is shown in fig:11 similarly when the rain will be deleted output will be shown as in fig:12 for any movement of cattle has been entered in the field, red light will be shown by the sensor and also a notification will be sent to users phone as shown in fig:13 for knowing the movement of pumping water to the field, if the pump is in ON condition, a green button in dark color will be seen and if it's in off. Condition, green button in normal color will be shown as Fig: 14 and the final output of the system is proposed in Fig: 15.

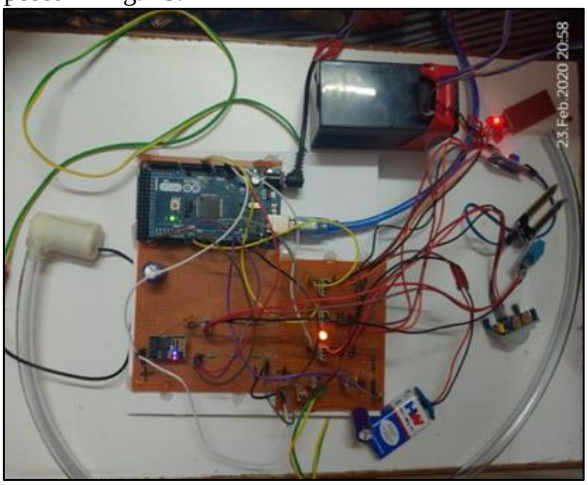

Fig. 8: Hardware kit

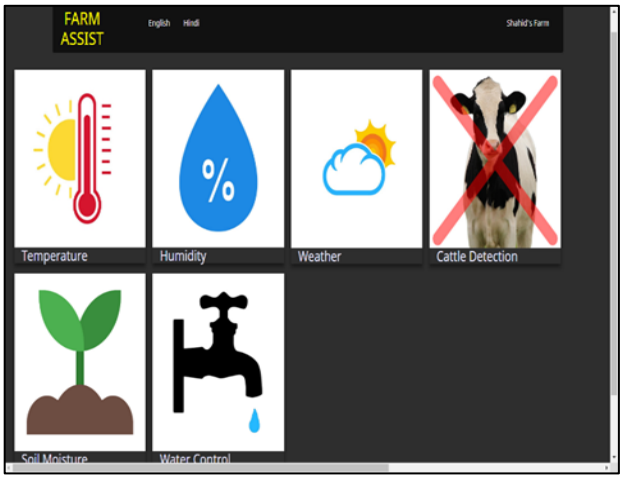

Fig. 9: Software User Interface

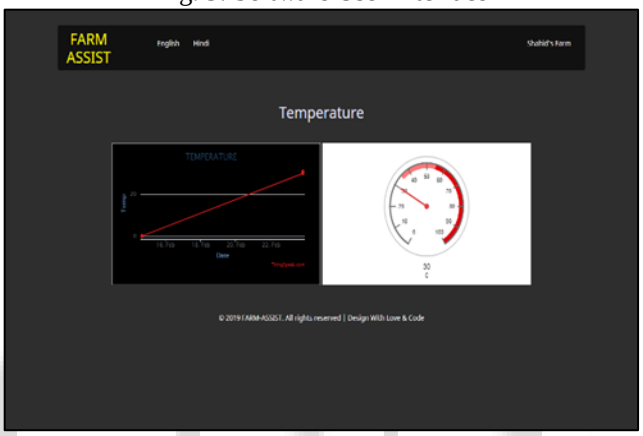

Fig. 10: User Interface for Temperature

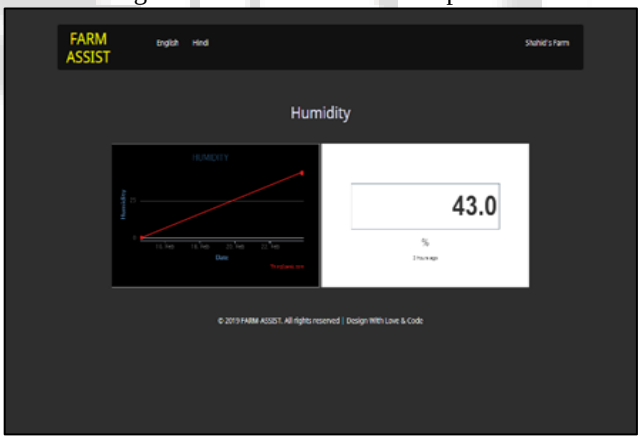

Fig. 11: User Interface for Humidity

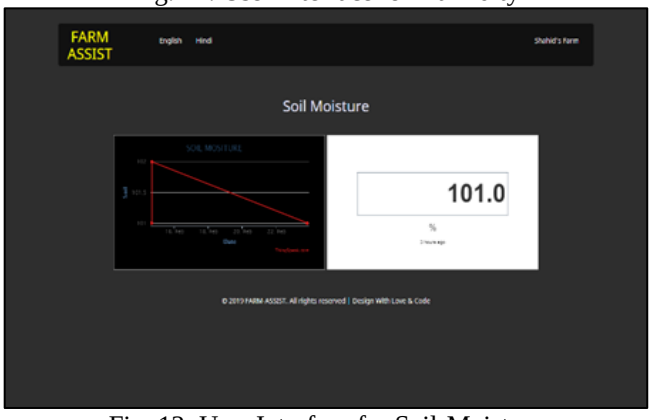

Fig. 12: User Interface for Soil-Moisture

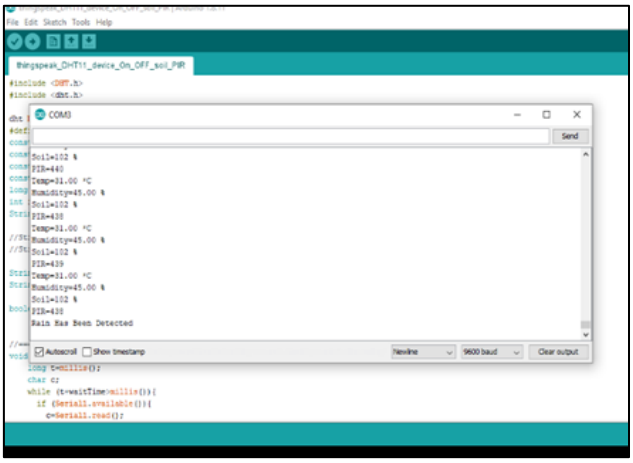

Fig. 13: Output for Rain Detection

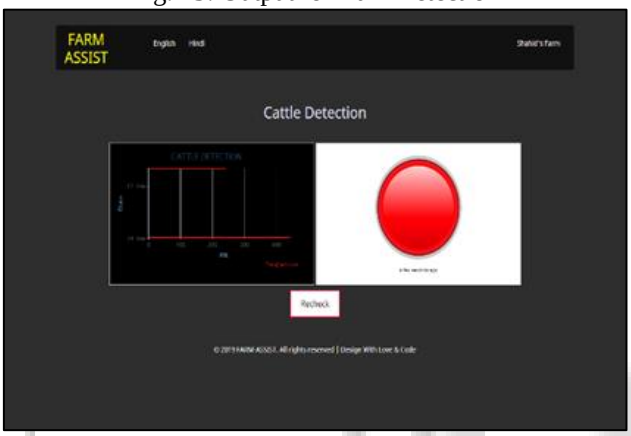

Fig. 14: User Interface for Cattle Detection

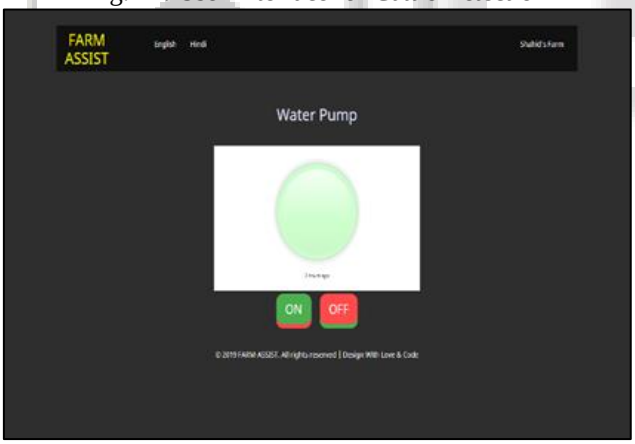

Fig. 15: User Interface for Water Control

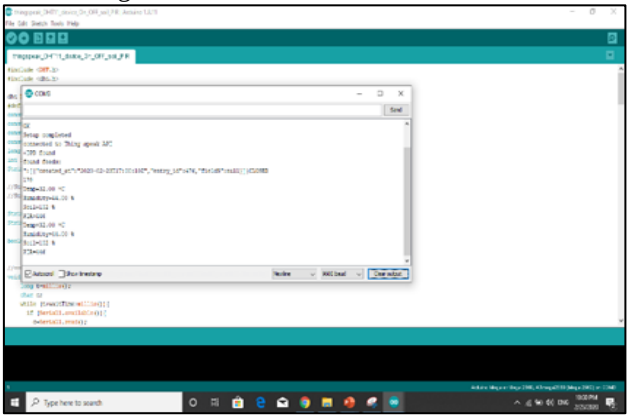

Fig. 16: Final Output

V. CONCLUSIONS

From this system, we can basically detect the temperature, measure soil moisture, can detect the movement of any animals which enters into the field and can ON/OFF the water pump which can be done in both ways (manually as well as automatically). By measuring the soil moisture, if its dryness came to less than 30% then the water pump will be automatically turned ON and vice-versa. Through this system, crops will be saved from any animals and when any movement is done in the farm, the farmer will automatically came to know that there is someone in the farm Farmer can control his farm from anywhere with a proper internet connection. Our system is eco-friendly as it requires only sun-rays to operate. This system developed is beneficial and works in cost-effective manner. The semi-automated irrigation system has been designed and implemented in this paper. This developed system is much more helpful and gives more feasible results.

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