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Agriculture Multi sensor Data Fusion and Analysis System

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Abstract— Multi-sensor data fusion is an new technology to fuse data from multiple sensors for making a more accurate approximation of the Agricultural environment and soil by measurement and detection. Applications of Multi-sensor data fusion cross a wide spectrum in Agriculture and civilian areas and we are using in Agriculture field. With the rapid growth in the field of computers, electrical systems sensors, and utilization of Multi-sensor, data fusion is being popularized in research and applications. This research work concentrate on application of Multi-sensor data fusion for better quality data analysis and processing in measurement and Analysis. A practical, general data fusion scheme was established based on feature extraction and merge of data from multiple sensors. A number of successful applications in areas of precision agriculture are described. This project gives an overall data analysis of using the Multi-sensor data fusion method to increase the accuracy of data analysis and processing in measurement and Analysis of different parameter of different sensors.

***Index Terms*— Multi-sensor, fusion, measurement and Analysis.**

I. INTRODUCTION

Our Problem statement is that in conventional way of agriculture field so many problems like no proper information about current condition of soil moisture, resistivity of soil, climate humidity and temperature. Some instrument and system developed and available for agriculture field but it's not successful and sufficient. Because agriculture area is so vast, those measure parameters through hand on particular place. Is too difficult to know complete information about agriculture field parameters and nearest environment. We are thing about this problem, which face by farmers and its effect on productivity of crop and yield. So we need to design and develop multi-sensors data fusion and analysis system which remove all this problems.

In our fusion system design, first single mote consists four basic parameters. We will be designing software in PC which will be acting as an interface for the hardware interaction and this will extract parameters from different motes for the fusion/ analysis purpose. This Solution is to provide opportunity to reduce this gap by providing access to information to the end users (farmers) and increasing in yield and productivity.

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II. ARCHITECTURE OF DATA FUSION

Data fusion architecture was found in military and non-military application

A. APPLICATIONS – MILITARY

Multi-sensor data fusion (MSDF) systems use different types of sensors to combine data, obtaining a extended picture of the situation [6]. MSDF may also be programmed to make interferences using given information to create new data. The object behind this technology is to increase the effectiveness of military objectives by giving a more complete, merged view of situations to enable a fast response while eliminating errors caused by single failure.

The military relies upon various sensing sources in the battlefield. Because of the huge resources providing soldiers with information, the military comprise probability algorithms into sensor fusion systems that effectively process the sensors' information. Civilian sensor fusion technology includes applications to robotics, geospatial analysis , and business intelligence. The lists military sensor fusion systems, describes MSDF increases contributions toward sustaining human life, and overviews the future of multi-sensor data fusion technology..

B. APPLICATIONS - NON-MILITARY

REMOTE SENSING

Application of remote sensing include monitoring atmospheric climate, environment, water sources, black soil and agriculture as well as discovering natural sources and fighting the important of ban drugs. Fusing or integrating the data from passive multispectral sensors and active radar sensors is necessary for draw out useful information from satellite or airborne imaginary.

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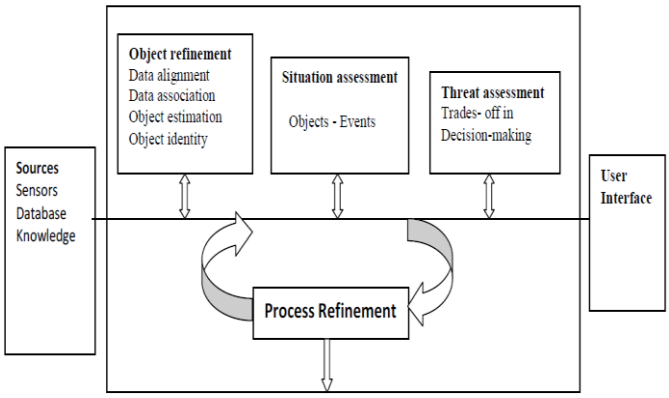
Remote sensing
A-Agricultural Crops
B-Weather patterns
C-Environment
D-Mineral resources
E-Buried hazardous waste

C. ARCHITECTURE OF DATA FUSION MODEL

To ensure that systems are operate on defined conditions,

measurements are taken which, when analyzed, enable conclusion to be made based on condition. These measurements can produce data that are either very similar, often from the same sensor, or completely different from different techniques. Analysts have traditional manner undertaken the analysis of this data. However, with the improve computer power and development of new and novel detection systems, the data produced necessarily to be handled in a tremendous and logical manner. As such computer systems have been developed that are adequate of extracting meaningful information from the recorded data. The combining of data, recorded from a multiple sensor system, together with ignition, is known as data fusion.



In this figure Joint Directors of Laboratory [JDL] to address some of the main issues in data fusion and chart the new field in an effort to unify the terminology and procedures. The present applications of data fusion span a wide range of area of agricultural remote sensing [8].

III. METHODOLOGY AND IMPLEMENTATION

This study was designed to streamline the research and development efforts in progress to promote tillage crops-sowing technologies. Rigorous survey and analytical procedures were used to determine the real benefits of these new technologies to the farming community and to provide feedback to the research and analysis system. Analytical procedures were used to draw conclusions for suggesting appropriate which crop is good and to advise suitable condition for that.

Study of crop started from taking sample of soil and other environment parameter by sensors and that data fuse and they suggest for crop. Method of achieving the optimum data fusion of multi-sensor for agricultural remote sensing. Through implementation of the multi-sensor fusion system, future multi-sensors will ensure the benefits of data fusion are maximized and the risk of error target recognition of agricultural remote sensing is minimized.

Methodology of fusion is very important part of forecasting. This methodology consists several levels which support for taking decision, first collect sample of parameters then parameters senses by sensors of selected motes and forward to fusion station, then we extract data and then alignment it. Fused data is stored into database, which can be displayed as per the requirement

A. *DATA COLLECTION STRATEGY.*

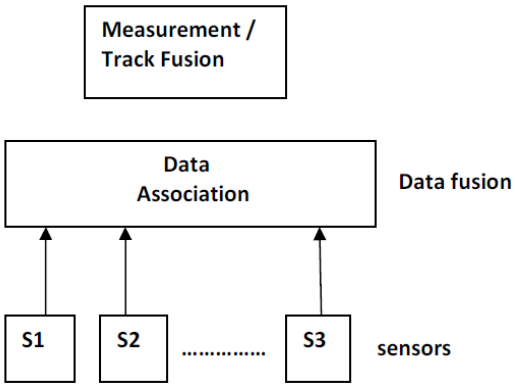
Different disciplines, including wheat, soybean, groundnut and other agriculture crops. this are few crops on which data collection strategy were suggested by agronomists, farm engineers, agricultural economists how to collected data and which strategy beneficial, which method is useful, and different condition good of different types of crops for different seasons. According to strategy of agronomist we collected parameters from different mote. align that data for specific database for today to complete year.

B. *FUSION IMPLEMENTATION*

While today's sensors are increasing in accuracy, they are also required to operate in conditions where distortions, clutter, and saturations can have an adverse effect on their performance. Usually, to account for such contaminated sensor data, the covariance of the white noise error and other errors is increased. Unfortunately, this approach to account for this external error and noise sources defeats the improved sensor accuracies. Recently, various algorithms have been developed using fuzzy logic and neural network-based techniques to improve the error modeling and processing in multisensor data fusion. The development of an open architecture software structure that will provide the capability to develop various data fusion implementations by mixing and matching algorithms.

This software test bed permits the selection of various algorithms this software test bed permits the selection of various algorithms and parameters that provide the user with a capability to analyze the performance of the algorithms in various combinations to determine the most effective data fusion algorithms for specific conditions.

For this improvement to be realized in multi-sensor data fusion, the development of a coherent scene from information provided by a myriad of sensors must be enhanced from its current technological state.



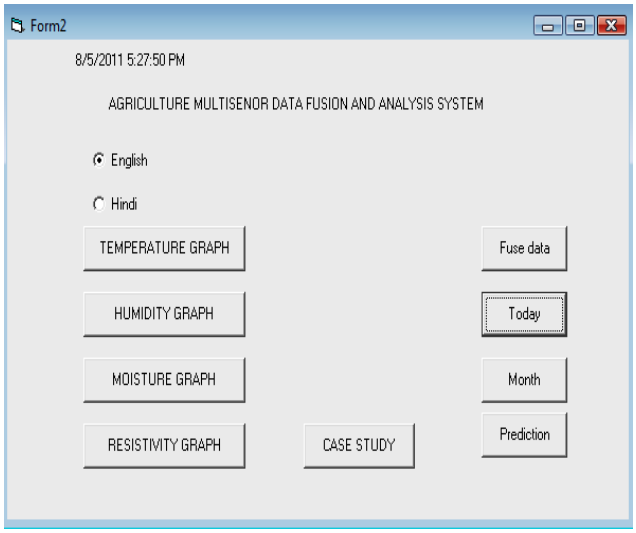
IV. FUSION OF DATA FROM MULTIPLE SENSORS

Data fusion for multiple sensors is very big and complicated task. But its advantages is huge because in data fusion takes multiple data for multiple sensor its advantage is results will be more accurate, on the basis of that we can predict which condition is beneficial of use and which thing

is good for us.

So we can see in figure 4.1 the agriculture mutisensors Data fusion window, several option on their fuse data is we collect whole data for month and different times on day according to algorithm finally data comes in fuse data window on the bases of that we predict which crop is beneficial for whether condition and also analysis by different parameter graph.

Case study is important part of our project. we select mushroom crop for case study because we can grow whole year and is not required land and natural atmosphere condition we can grow mushroom in room and maintain condition according to mushroom. We soil planted our system on mushroom growing room and analyze condition.



V. PARAMETER ANALYSIS

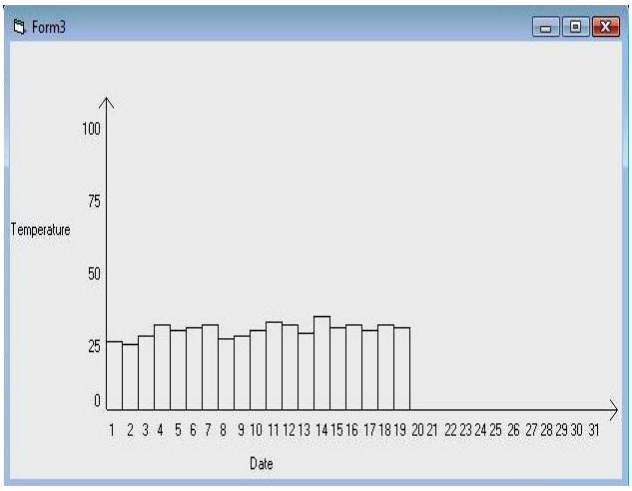
In multi-sensor data fusion and analysis system following parameter is analyze for Rabi and kharib crop, which is temperature, moisture, humidity & soil resistivity. These are the parameter analyzed by system. Every parameter having own specification for wheat crop.Those are as follow:-

1. Temperature
2. Moisture
3. Humidity
4. Resistivity

1. Temperature

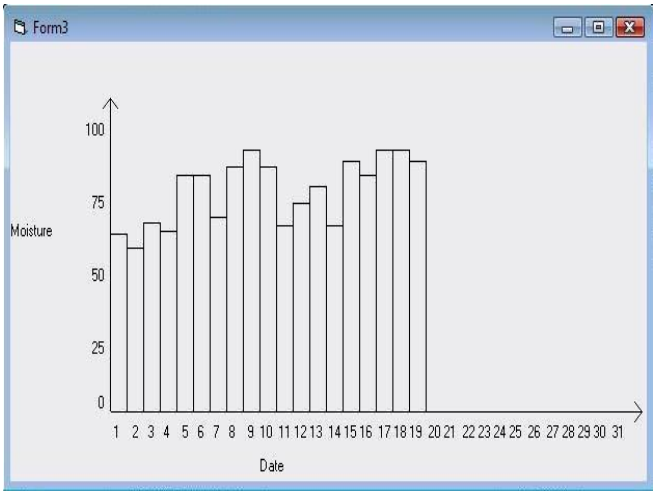
Temperature is also important parameter in the field of agriculture. Contribute about 50% of the total value of agricultural production. Requires a mean annual temperature of 24º C with a range of 16ºC to 32ºC. Rabi crops also grown in black soil in areas of Madhya Pradesh. Plants produce highest possible growth when exposed to a day temperature.

This permits the plant to photosynthesize and respire during an most favorable daytime temperature. Low temperatures can result in imperfect growth rate. Photosynthesis is falling down at low temperatures. Since photosynthesis process slowed, growth has slowed, and this results in minimum yields. Not all plants grow maximum in the same temperature range. In figure4.2 show that what is temperature range in following date. So we can predict which crop is beneficial for this temperature range



MOISTURE

Moisture is very important parameter of agriculture. Because life of crops is mostly depends on the specified range of soil moisture. Water is the life of plant and must be supplied in proper quantity. Maximum of the soils get water through the rain and supplemented by irrigation.



The separation between two irrigation depends mainly on the rate of soil moisture depletion. Normally the crop should not allow extracting more than 50% available water. The separation are shorter in sandy soil than heavy soil. If the water supply is very limited, the crops are irrigated only at critical level. Following are the important crops need to be irrigated at critical stages.Figure 4.3 shows graph between moisture and date by this we can get moisture level of soil according to date. If moisture level goes down or moisture level goes up we can maintain this condition for future operations

HUMIDITY

Relative humidity is the ratio of actual water vapors content to the saturated water vapors content at a given temperature and pressure expressed in percentage (%).Relative humidity (RH) directly impact the mutual connection between water and plant and indirectly impact on leaf growth, photosynthesis, pollination, occurrence of infection and

finally economic yield. Moderately low air humidity is favorable for seed set in numerous crops, provided soil moisture supply is adequate. For example, seed set in wheat was high at 60 % RH compared to 80 % RH when water availability in the soil was not limiting. Shows humidity graph in figure.

VI. DATA FUSION SYSTEM USE

A number of sensors measure different quantities associated with the same experimental situation, as, for example, temperature, moisture, resistivity and humidity. Sensors measure the same attribute over a number of different ranges.

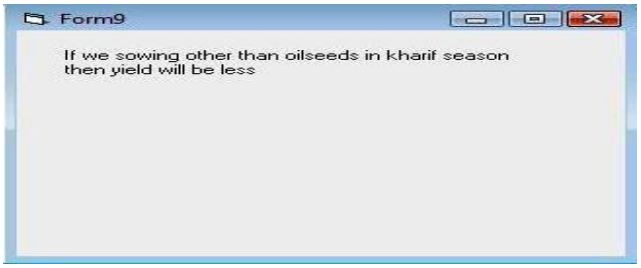
Current measurements are fuse with historical information, for example, from an earlier calibration. Often the current information is not sufficient to determine the system accurately and historical information has to be incorporated to determine the system accurately.

Use of data fusion system and its several options. We planted our system in agriculture field for the analysis of environmental condition and prediction of future conditions. If we taken data time to time and see what is weather condition of whole month so we click on month block and new window has been open

PREDICTION

Prediction is important part of agriculture fusion system, it suggest according to database of parameters, which crop is beneficial for this agriculture land and environment.

CONCLUSION



Multisensor fusion and integration is a technique to get better outputs or result by combining the outputs of more than one Sensor. It has a very wide range of applications and hence a require more development in this field. On the base of fuse result we can say which crop is beneficial for this soil and environment condition is that by agriculture multisensory data fusion and analysis system report the results of Agricultural information. This system is very useful for monitoring of environmental conditions at the field. By knowing the information a farmer can take quick action such as selection of crops, provide irrigation or use fertilizer according to crop and soil condition. This system can increase the productivity of crops.

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