A Review of Sensor Application in E-Farming

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Abstract—Sensor applications have a serious influence on everyday objects that improve the human quality of life. Key topics should be soil biological sensing, crop production and post-harvest implementation. Topics associated with soil sensing involve soil content control, sewage systems and soil erosion movement paths when harrowing, while seedling detection issues involve assessment of winery spray drift applications, implementations of winter wetland thermal imaging, forest wellness systems and remotely sensed applications.

Keywords—E-Farming, Machine Learning, IOT, Deep Learning

I. INTRODUCTION

Agricultural farming is the key Profession all around India. Despite this due to climatic variation and global warming the farmers facing huge problems such as less cropyield, various diseases on leaves, stems, fruit, etc. The living standard of farmers has been highly affected due to poverty and the mortality rate of farmers is increasing day by day. Modern technology automated machines, sensor application, image processing, spectral data analysis, machine learning leading the world to new heights. The major agriculture operations are land preparation, seedbed preparation, plantation, irrigation nutrition, plant/crop protection, and harvesting. All these operations can be automated by sensor application. Land preparation can be done using GPS based tractors and driverless work by programming. Sensor application is helpful for farmers in Argo marketing. E-farming will be helpful for farmers to sell their products all over India and abroad by getting the basic knowledge of the website. This paper illustrates the review of the application of sensors in agricultural farming and e-marketing, various SMS facility in the local language provided by the e-portal.[2]

II. REVIEW

Deep Learning in Agriculture

DL is the most favorable solution to image processing because of the decreased need for feature engineering (FE). The conventional method for image classification problems was based on hand-engineered features, the consistency of which had an impact on the overall results. FE is a challenging, time-consuming procedure that has to be updated if the dataset changes. FE is a cumbersome operation that dependent on the guidance of experts and does not generalize properly. DL downside is longer preparation time, testing time is quicker than theories that focus on ML. DL incorporates problems that could arise when using pre-trained models on limited or substantially different datasets, scalability issue due to the complexity of models and hardware constraints.[1]

In Table 1, features are developed along with the images acquired by the sensing methods. Current sensing technologies, such as multi-spectral, hyperspectral, satellite-based imaging. Synthetic aperture radar (SAR), thermal and near-infrared (NIR) cameras are used to a limited yet growing degree, although optical and X-ray imaging are used in the processing of fruit and packaged foods. DL is about “deeper” neural networks that provide a centralized representation of the data via a diverse range of convolutions. This improves information learning abilities and therefore higher robustness.

Future of DL in agricultural production is the only problems of land involve categorization, crop type estimation, crop phenology, weed detection and fruit grading. It is impressive to check how DL would deal with agricultural related problems like Leaf classification (Classify leaves of different plant species), Plant and Leaf disease detection, Plant phenology recognition (Identify plants from leaf vein patterns of white, soya and red beans) with agricultural applications such as Mapping land and plants, phenology of crop, observing crops etc. [1]
Table 1 Describes Remote sensing techniques used to enhance agricultural application with data analysis methods.

<table>
<thead>
<tr>
<th>Sr No</th>
<th>Agricultural Applications</th>
<th>Remote sensing</th>
<th>Methods for data analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Mapping of land and plants</td>
<td>Hyperspectral imaging, multi-spectral imaging, SAR</td>
<td>Image fusion, SVM, and member extraction algorithm, co-polarized phase difference, linear polarization, distance-based classification, decision trees, linear mixing models, logistic regression, ANN.</td>
</tr>
<tr>
<td>2.</td>
<td>Phenology of crops</td>
<td>Satellite remote sensing (general)</td>
<td>Wavelet based filtering, fourier transforms, NDVI</td>
</tr>
<tr>
<td>3.</td>
<td>Index of photosynthetic activity and seed canopy</td>
<td>Hyperspectral imaging, multi-spectral imaging</td>
<td>Linear regression analysis, NDVI</td>
</tr>
<tr>
<td>4.</td>
<td>Observing of crops</td>
<td>Satellite remote sensing, NIR camera, SAR</td>
<td>Feature extraction, linear regression analysis, co-polarized phase differences, linear polarizations, classification and regression tree analysis</td>
</tr>
<tr>
<td>5.</td>
<td>Crop classification and ecossystem readjustment</td>
<td>Remote sensing in general, cameras, and photo-detectors, hyperspectral imaging</td>
<td>Principal Component Analysis, feature extraction, linear regression analysis</td>
</tr>
<tr>
<td>6.</td>
<td>Crop height, estimation of yields, fertilizers affect and biomass</td>
<td>Light Detection and Ranging (LIDAR), hyperspectral and multi-spectral imaging, SAR</td>
<td>Linear and exponential regression analysis, linear polarizations, wavelet based filtering, vegetation indices, ANN.</td>
</tr>
<tr>
<td>7.</td>
<td>Irrigation</td>
<td>Red-edge camera, thermal infrared</td>
<td>Image classification techniques, decision trees, linear regression analysis, NDVI</td>
</tr>
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<td>8.</td>
<td>Pest detection and management</td>
<td>Satellite remote sensing, microwave remote sensing, thermal camera</td>
<td>Image processing using simple imagery, linear and exponential regression analysis, statistical analysis, CEM nonlinear signal processing, NDVI</td>
</tr>
<tr>
<td>9.</td>
<td>Weed detection</td>
<td>Remote sensing in general, optical cameras and photo-detectors, hyperspectral and multi-spectral imaging</td>
<td>Pixel classification based on k-nearest clustering and Bayes classifier, feature extraction techniques with FFT and OGLCM, wavelet-based classification and Gaussian filtering, genetic algorithms, fuzzy techniques, artificial neural networks, erosion and dilation segmentation, logistic regression, edge detection, color detection, principal component analysis</td>
</tr>
<tr>
<td>10.</td>
<td>Packaged food and food products identification of contaminants, disease or defects, bruise detection</td>
<td>X-ray imaging (or transmitted light), CCD camera, microspherical images with different illuminations, thermal cameras, multi-spectral and hyperspectral NIR-based imaging</td>
<td>3D vision, invariance, pattern recognition and image modality, multivariate image analysis with principal component analysis, K-nearest neighbors, clustering, K-nearest neighbors, classification trees, decision trees, fusion, feature extraction techniques with FFT, standard Bayesian discriminant analysis, feature analysis, color, shape and geometric features using discrimination analysis, pulsed-phase tomography.</td>
</tr>
<tr>
<td>11.</td>
<td>Greenhouse monitoring</td>
<td>Optical and thermal cameras</td>
<td>Linear and exponential regression analysis, unsupervised classification, NDVI, IR thermography</td>
</tr>
<tr>
<td>12.</td>
<td>Agricultural expansion and intensification</td>
<td>Satellite remote sensing in general</td>
<td>Wavelet-based filtering</td>
</tr>
</tbody>
</table>

Table 1: Tabular representation of Computer vision on Agriculture IOT Based Monitoring System in SmartAgriculture

The IOT-based improved agricultural system can prove to be very helpful to farmers, since over as well as less groundwater irrigation is not beneficial for agriculture. The threshold values for atmospheric zones such as moisture, pressure and temperature can be established on the basis of the climatic factors of that specific area. The platform also senses the invasion of animals, which is the major reason for crop reduction. The whole system generates an irrigation schedule based on field and climate repository data sensed in real time. This system can strongly advise whether or not a farmer needs irrigation. There is a need for continuous internet connectivity. This can be overcome by extending the system to send a suggestion via SMS immediately to the farmer on his mobile phone using the GSM Technology instead of the smartphone app. Smart farming has been designed with the help of the Internet of Things (IOT). The remotely operated vehicle operates both in manually and automatically, for various agriculture activities such as spraying, cutting, weeding, etc. The controller keeps track of atmospheric pressure, moisture, soil composition and supplies water to the field accordingly. Based on the use of green energy and smart technology, agriculture sector will find better productivity.
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Agriculture The primary contribution of this research is to provide genuine insight into:

- World desires from of the agricultural sector.
- Very latest events in IoT, both scientific and manufacturing, are illustrated and how these advancements help to provide solutions to the agricultural sector.

Disadvantages of agriculture industry

- The role of IoT in acknowledging these restrictions and other issues including such resource depletion and appropriate consumption, food spoilage, climate change, environmental pollution and industrialization.
- Strategies and policies that need to be considered when implementing IoT-based modern technologies.
- Significant challenges that remain to be addressed and possible solutions that have been further required, while recommendations are done to improve these obstacles.

Major Applications

Intelligent agricultural practices, IoT can contribute to enhance solutions to many conventional farming problems, such as drought response, yield standardization, land appropriateness, irrigation and pest control. Figure 2 lists the hierarchy of primary advantages, services and wireless sensors used for improved agricultural application areas.

Fig. 1 IOT in Agriculture

Fig. 2 Applications of smart farming
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REFERENCE