REMOTE SENSING BASED SEASON CALENDAR FOR INDIAN DISTRICTS USING MODIS DATA

Sudhir Gupta, Vinay Pandit, K.S.Rajan

Lab for Spatial Informatics, International Institute of Information Technology, Hyderabad, INDIA
sudhir@research.iiit.ac.in, vinaypandit@research.iiit.ac.in, rajan@iiit.ac.in

1. INTRODUCTION

Indian crop calendar was first prepared and published by Ministry of Agriculture in 1966-67. The working group on agricultural statistics for the tenth five year plan set up by the planning commission was informed that due to changes in agricultural practices and cropping pattern, the need for revising the crop calendar on priority was felt. The group also recognized the critical role of space applications for such activities with the use of remote sensing technology [1]. In this paper, a system for deriving seasonal calendar for crop regions at the district (similar to US counties) level for Indian districts is proposed. This is a precursor to the automatic derivation of crop calendar from satellite imagery which would require expert knowledge that can relate the phenological parameters extracted to particular crops

Of the various conventional methods available for deriving crop calendar, a remote sensing based approach has been found to be a cost- and time-effective solution, providing near-real-time information. In the Indian context, researchers have mostly used crop calendar as an input to crop classification systems [2]. Some work is done to derive crop calendar using satellite imagery for particular crops and particular regions [3][4].

2. DATA AND METHODOLOGY

The MODIS 250-m Vegetation Index (VI) product (MOD13Q1), which consists of NDVI (Normalized Difference Vegetation Index) and EVI (Enhanced Vegetation Index) data composited at 16-day intervals is used in this study. EVI was used as it is less noisy than NDVI. This data holds considerable promise for regional-scale crop mapping given its resolutions, large area coverage, and cost free status. Time series of EVI images for cropping seasons 2003-04. 2004-05 and 2005-06 were constructed for six districts of Karnataka state, India located in different agro climatic zones. These districts cover an area of 29,203 square kilometers. The time series data is filtered using a technique called local maximum fitting to remove data drop outs (anomalously low parameter sensed) and data gaps [5]. This paper will not describe the classification process in detail as it is under review[1]. It will be assumed that crop pixels are being identified. The paper will focus on the extraction of phenological parameters and the utility of these parameters in deriving seasonal calendar at the district level. Every pixel-time trajectory of crop pixel is filtered using Savitzky-Golay filter [6] to adapt to upper envelope as shown in figure 1. Five phenological parameters are extracted 1) time for the start of the season 2) time for the end of the season 3) time for the mid of the season 4) base level and 5) Seasonal amplitude. These parameters are illustrated in figure 2. Two major seasons are identified by binning these parameters and represented using Gantt charts

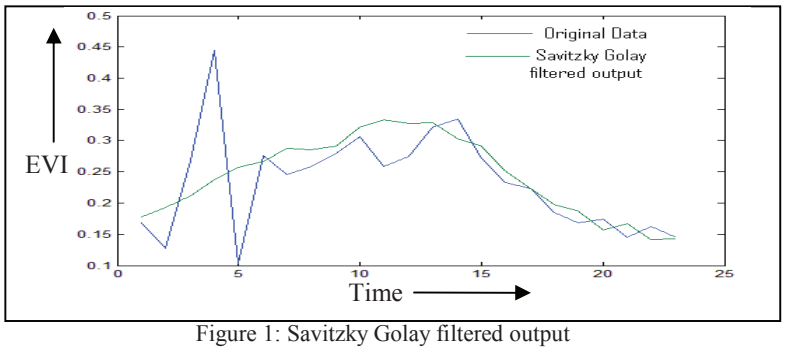

Figure 1: Savitzky Golay filtered output

[1] Submitted to IEEE Computer Society International Conference on Computer Vision and Pattern Recognition (CVPR 2009)

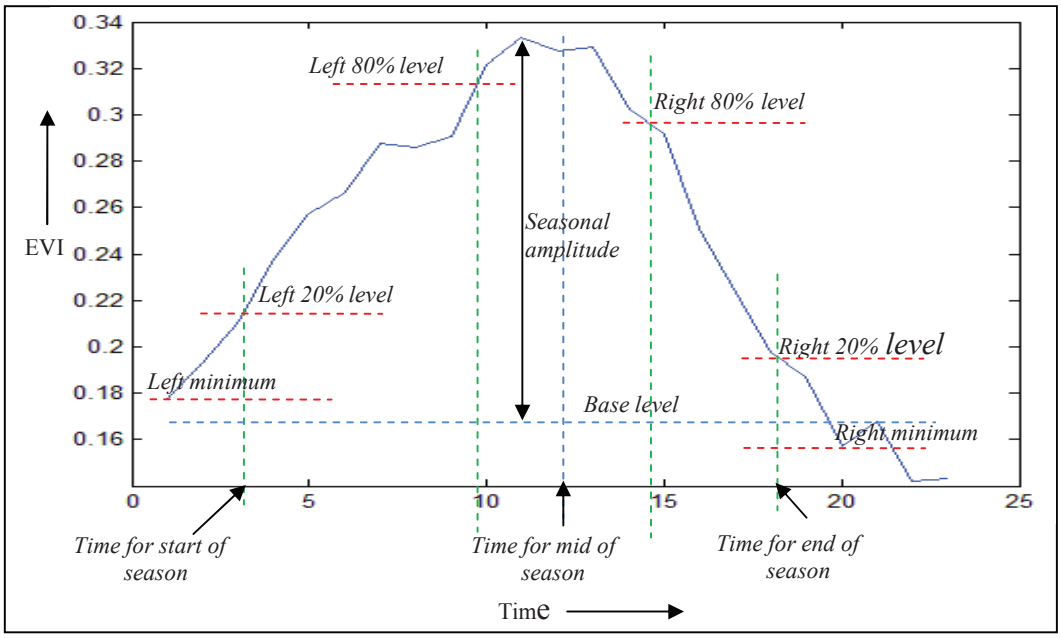

Figure 2: Illustration of extracted phenological parameters for a single season

3. CONCLUSION

The results show that remote sensing can be successfully used to derive season calendar at the district level for Indian districts with moderate resolution satellite imagery. Expert knowledge like that of an agronomist or a published crop calendar can be used to correlate the seasonal calendar to particular crops for crop mapping. This will lead to automatic crop classification which is an important input to a satellite based crop management system.

4. REFERENCES

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