LARS INFORMATION NOTE 030667

Purdue University

LABORATORY FOR AGRICULTURAL REMOTE SENSING

Automatic Classification of Ground Cover

This Note contains a brief description of some results from the automatic classification of agricultural cover using multispectral means. The specific problem treated here is the automatic classification of the areas over-flown into one of four categories. The categories, together with the symbol used to indicate them on the printout, are as follows:

Bare Soil	X
Water	I
Green Vegetation	G
Other	(Blank)

The "other" category includes such areas as roads, mature wheat fields, and all other types of cover which do not logically fall in any of the other three categories. The flight line used was that of flight line C1, using data obtained in late June. This is the same data used in connection with LARS Information Note 21567. Reference to the aerial photograph and printouts provided with that Information Note will be helpful.

The results of the classification task are shown on the attached computer printout. This printout also shows (manually added) field boundaries and ground truth in the form of a letter symbol and two numbers. The letter symbols indicate the primary agricultural cover, and are as follows:

A - Alfalfa	O - Cats	RC - Red Clover
BS - Bare Soil	R - Rye	SC - Sweet Clover
C - Corn	S - Soybeans	Tim - Timothy
FS - Farmstead	W - Wheat	Sudan - Sudan Grass
	P - Pasture	

The two numbers indicate the crop height in inches and the estimated percent ground cover from one or two points near the edges of the fields.

These results appear to be again very good in general. Although there was little water in the flight line from which to thoroughly test the difficulty of correctly classifying water, it would appear there will be no difficulty in distinguishing it from the other categories.

The accuracy obtained in the bare soil classification also appears very good. There were in this flight line only two fields of entirely bare soil. They are in the vicinity of scan line 500 and scan line 649 to the left of the center of the flight line. There were several other fields that were partially bare and have been so classified. An example of this is in the long, narrow field between scan lines 2635 and 2959, and column numbers 193 and 199. Ground truth indicates that this field had been plowed in early season, then left to grow in weeds. The large field just to the right of this one was a soybean field, the right half of which was planted later than the left half.

A close inspection of the areas classified as green vegetation indicates it may be possible to correctly recognize green vegetation down to about 20 percent ground cover. An example illustrating this is given

by the soybean field between lines 595 and 691, just left of the center line. It is seen from the ground truth marked on the printout that this field had about 20 percent ground cover.

A photograph of a portion of this field is also attached. The photograph was taken from a location equivalent to scan line 619, column 121, and looking in the direction of scan line 637, column 155. It is seen that there is a weed condition in this field, and it is possible to correlate the weed areas (areas of higher green cover) with the location of the G's. On the other hand, the two soybean fields to the right of the center line and near scan lines 505 and 577 have less than 5 percent cover and it is seen that they were not classified as having green cover.

One final illustration of the ability to classify green vegetation is given by the single G at scan line 3193 and column 99 in the midst of the large field in the "other" category. The color photograph attached shows this to be a patch of weeds.

The ability to detect green vegetative cover at low percent ground cover could be most significant, since it could make feasible a December winter wheat survey. It could also be valuable in determining range conditions and other applications.