

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Website: www.ijirset.com

Vol. 6, Issue 4, April 2017

ARM PROCESSOR BASED AUTOMATIC SOIL COLOUR SENSING

NANDHAKUMAR T¹, AJITHA S.P², SANJITHA³, SUJITHRA S⁴

¹ Assistant Professor, Department of Electrical and Electronics Engineering, Sri Krishna college of engineering and technology, Coimbatore

^{2,3} PG Scholar, Department of Power Electronics and Drives, Sri Krishna college of engineering and technology, Coimbatore

ABSTRACT:

Measuring the soil colour is one of the important parameter for determining the various soil properties. Soil colours are mostly measured using the naked eye by the method know as musell soil colour chart. Automatic sensing and displaying of soil colour can be done through the embedded system. Colour sensor of TCS 3200 is used in this paper. Displaying the output in the LCD screen and processing of the data from the sensor is processed through the arm processor. Embedded C is used for implementing automatic sensing and display of algorithm.

INDEX TERM- Soil colour and property, Munsell soil colour chart, colour sensor, arm processor.

1.INTRODUCTION

The sensor gathers the information directly from the processor and converts it into electrical quantities, depending on the application and the needs such as voltage and current. As in munsell colour chart, it is difficult to determine the soil colour because the is a need of perfection in the work, a small mistake in the chart may change the soil colour. Since it is a man work process there is a discomfort to the worker, in order to avoid such discomfort we can go for sensing through arm processor. This will give the instant output to the input given.

1.1 Munsell colour chart:

The munsell book of colour includes nine charts and 322 different standard colour charts. The colour designation is by separate notation of hue, value and chroma. The symbol of hue is the letter abbreviation of colours of rainbow which lies between 0 to 10. as the number decreases, the hue become more yellow and as the number increases, the hue become less red. As the number is 0 it is of absolute black and as the number is 10 it is of absolute white. The hue notation indicates that it is related to red, yellow, green, blue or purple, which is in the top right side if the leaf. Value indicates its lightness, which is indicated by the vertical axis and the chroma indicates its strength., which is denoted by the horizontal axis in the munsell chart.[1]

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Website: www.ijirset.com

Vol. 6, Issue 4, April 2017

1.2 Drawbacks of conventional method

From the munsell colour chart the probability of matching the sample colour with the chart colour is less than one in hundred. Since the exact match of the color cannot be obtained only the closest matches to the colour chart. Difficulties included in using clour chart are as:

1. Selection of hue card should be appropriate.
2. Determine of the colour should be intermediated between the hues
3. Dhe chromas must be strong while distinguishing the value and the chroma. This conventional techniques is prone to error. Since the readings are based on the naked eye the perception may vary from person to person, which may reduce the accuracy in the soil colour measurement.

2. COLOUR SENSING SYSTEM

The colour of the soil is sensed and it is converted into frequency output. Then the output is compared with the standard value from the memory of arm processor which is taken from the munsell clour chart.

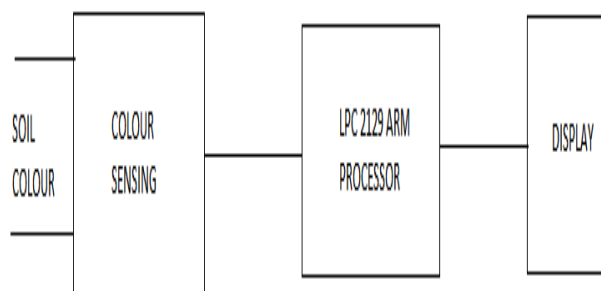


FIG.1: BLOCK REPRESENTATION OF COLOUR SENSING SYSTEM

2.1 COLOUR SENSOR:

The colour sensor consists of the photodiode and the current to frequency converter. As the intensity of light falls in the photodiode, the output of the photo diode changes. As colour chages the intensity is varied with the variation in the current of the photo diode.[2]

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Website: www.ijirset.com

Vol. 6, Issue 4, April 2017

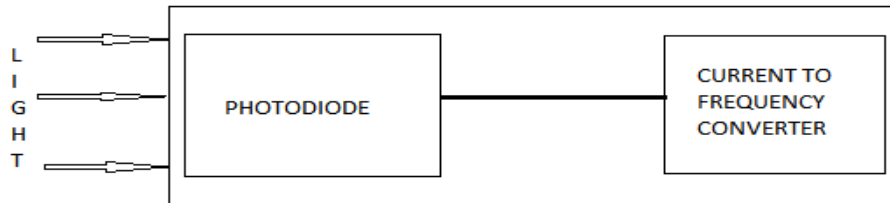


FIG.2: BLOCK DIAGRAM OF COLOUR SENSOR

Colour sensor features:

- Conversion of high resolution light intensity into frequency.
- Direct communication with microcontroller.
- Nonlinearity error of 0.2% at 50kHz.
- Low-profile lead(pb) and RoHS.
- Programmable colour and full-scale output frequency.

2.2 ARM LPC2129:

Arm is an advanced Risc machine with less number of instruction code set. In microcontroller family ARM processor is an advanced processor with enhanced computational ability and performance. The ARM design key philosophy is the simplicity. The ARM7 is a RISC computer with a small count which make it deal for embedded systems.

It has high performance, low power consumption and it takes small amount of available silicon die area.[3]

Features of ARM LPC2129:

- They have high code density with hardware debug technology.
- Load store architecture.
- For certain execution there will be cycle execution.
- 16 bit instruction set.
- Instruction set is orthogonal.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Website: www.ijirset.com

Vol. 6, Issue 4, April 2017

2.3 LCD

To display the colour of the soil 16*2 line LCD is used. LCD is interfaced with a microcontroller with byte mode.

COLOUR	AVERAGE FREQUENCY (kHz)	EQUIVALENT HEX COUNT	HUE, VALUE AND CHROMAS
GREY	4.8	BBCD	H=7.5 YR , V=6 , C=1
DARK GREY	5.75	E080	H=5YR , V=4 , C=1
RED	3.12	7B9E	H=2GY , V=5 , C=6
REDDISH BROWN	2.9	765F	H=2.5YR, V=5, C=3
BLACK	1.66	40E4	H=2 GY,V=1, C=3

TABLE 1.1 VARIOUS SOIL COLOURS WITH HUE , VALUE AND CHROMA

III. DESIGN AND IMPLEMENTATION

The following are the steps for identifying the frequency of the incoming pulses from the colour sensor .

- The sensor are placed inside the enclosed block and the soil sample are kept in the single opening of the enclosed box.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Website: www.ijirset.com

Vol. 6, Issue 4, April 2017

- The sensors gives the output in the form of pulse which are fed as input to the ARM processor
- The number of pulses are counted for pre determined time period for 10 sec
- For example consider the frequency of a colour as 1.6 KHZ, the equivalent count for 10 seconds is calculated ,

Time period =1/frequency

Time period = 1/2 k = 0.5msec

Pulse count for 10 sec =10000 m = 0.5

Equivalent HEX code = (40E4)h

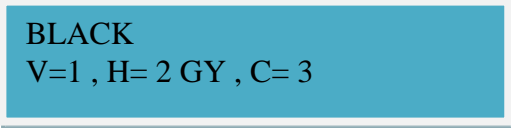
- With the help of the HEX number the colour can be identified .

There are few colours with their frequency , equivalent hex count and equivalent hue, value and the chroma notations in the table below

Experimental setup of the system :

The system is implemented in the laboratory to display the colour of the soil and the subsequent value hue and chroma as V , H and C respectively . The program is developed as per the flow chart .

The generated data base are applicable to the specific area for the soil characteristic analysis by the agricultural authorities or for the researches.



BLACK
V=1 , H= 2 GY , C= 3

FIG 3.1: OUTPUT DISPLAY ON LCD

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Website: www.ijirset.com

Vol. 6, Issue 4, April 2017

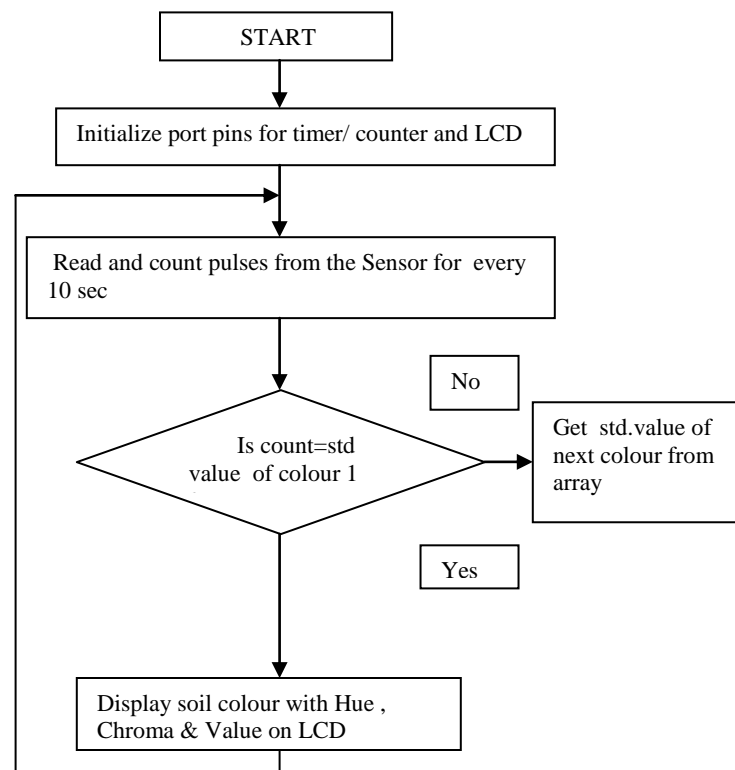


FIG 3.2 : SOFTWARE FLOW DIAGRAM

CONCLUSION

The colour of the soil can be sensed when interfaced with the suitable circuit and display various colours of soil. This paper involves the unmatched accuracy of soil colour which presents the design and implementation of handy tool for the professionals of the soil sciences. The accuracy of the soil colour is better when compared with Munsell soil colour chart. Further researches can be done for the betterment of soil quality.



ISSN(Online): 2319-8753
ISSN (Print): 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Website: www.ijirset.com

Vol. 6, Issue 4, April 2017

REFERENCE

[1] Envirothonpa.org/documents/munsellcharts.

[2] Automatic Color Sorting Machine Using TCS230 Color Sensor And PIC Microcontroller
Kunhimohammed C. K, Muhammed Saifudeen K. K, Sahna S, Gokul M. S and Shaez Usman Abdulla Dept.
of Applied Electronics and Instrumentation M.E.S. College of Engineering.

[3] Design of an ARM based microcontroller circuit board for the Amphibot II robot . Alain Dysli ,
Alessandro Crespi , Auke Jan Ijspeert .