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Fabric Variation and Visualization Using Light Dependent Factor

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Abstract: In the present-day scenario, we wear a variety of clothing but never know its fabric until unless a person touches or feels it. But is there any possibility to find its fabric without touching it? The answer for this query is yes, we can find a fabric type of clothing without any touch. Here comes an application of IoT, where each problem can be solved by things in real world problems. Fabric variation is a factor of recognition for a sensor where its resonance is the type and gives the sensor feedback. This type of mechanism scenario is used for regular period identifications of clothing. Pattern analysis in fabric, can speak a matter a lot in differentiation of types in it.

Keywords: Fabric, Light Dependent Resistor (LDR), light sensor, Arduino IDE, Scale, Photons.

1. Introduction

Fabrics [4] play a crucial role in synchronizing with nature. For that reason, people select their desired type according to nature and wish. The type of fabric [13][6] can be identified by pattern [7] of threading. By any user vision one can identify its type. Here comes our model where it identifies the type of fabric in dependency of light. From industry to regular scenarios retrieving the type of various fabrics when we use light as a dependency factor. To improve the efficiency in managing numerous numbers of fabrics identification [1] can be obtained with light factor. The amount of light passing through the fabric various to different types of clothing’s. To train a well performed model, we analyzed with large number of cloth fabrics of similar types and different types.

The fabrics were experimentally handled in analyzing its types accordingly on LDR light sensor. The LDR [5] light sensor deeply sympathizes the resistor changes and monitors on regular intervals. While this LDR acts as a good conductor towards bright light. So, we had placed the whole setup in dark area, so that no light factor disturbs our readings of resistor changes. The premise of this technique was uniquely identified after thorough study of existing models.

Here we have used four types of fabrics to obtain changes in LDR light sensor resistor values. These four types have different fabric patterns. To put further by discriminative power of our vision we introduced the light dependency which can variate for various types of fabrics. The results of our model shows that larger experimental analysis leads to better outcomings. The performance and robustness of this model is further discussed in next sections.

2. Literature Survey

From deep and thorough research study on various models and practical applications. The way to variate different types of fabrics differs from fabric to fabric on different parameters of study in analyzation. Various types of algorithms have been proposed in obtaining differentiating the type of fabrics. In view of variating the fabrics [3] used algorithm of convolutional neural network by proper sampling original images, the entire model efficiently extracted features and achieved a retrieval accuracy of 99.89%. But it has been decreasing quickly, when the fabric image contents have been reduced.

Using infrared rays, the type of fabric can be identified and these Infrared-Transparent visible-opaque fabrics can also be used as thermal management. These fabrics are widely used for various purposes, for that reason they are needed to be variated accordingly to the needs. The near infrared transmission through different fabrics were analysed by David A Hutchins *at al* [11]. In this paper it was widely analysed over various types of fabrics according to the physical characteristics. The amplitude levels after the transmission of NIR were testified on various physical factors in order to understand the fabrics.

3. Documentation of LDR sensor after analysis

In order to capture light data, analysis of light for experimentation of real time problems. In a study the analysis of LDR (Fig.1) was formally used as a voltage divider circuit, of 4.7 kΩ resistance of LDR and a battery [12]. The two pins of LDR captures all the light in free atmosphere falling towards cadmium sulphide. In point of its low cost, ease of its uses and manufacturer, LDRs are widely used for various applications in real time industry. Every application where there is a necessary of analyzation of light dependencies LDR can be used.

A photoresistor or LDR light sensor is effective to light and its applications. When a specific amount of light falls over it then there is a change in resistance. Values of the LDR resistance periodically changes over magnitude the amount of resistance passing as light increases. The LDR light sensor was manufactured in such way to exhibit light sensitive properties.

Whenever there is a dim light, no photons were absorbed to variate the resistance values between two pins of LDR. LDR light sensor is bad conductor during dim light. Light falls towards LDR light sensor makes to absorb photons and generate charge between the pins or electricity. This moment of absorption variates the difference in type of fabrics.

Fig.1: Light Dependent Resistor sensor

4. Procedure

Fabrics are our day-to-day necessities; we do identify them accordingly to our need and availability of the type of fabric we want. Here we used to analyze the fabrics differentiation accordingly by our sensor data’s. Generally, the fabrics can’t be testified through our senses, aim is to segregate types after thorough analyzation.

These types make a large difference in place of human. Using Light Dependent Resistor (LDR) as a very less cost light sensor where it helps to work on basic differentiations of experiments. The recurrent resistor readings give a clear picture of analyzation in feature of variation in different types of fabrics.

LDR light sensor works on a principle of changing values of resistor accordingly to the amount of light falling on it. Basically, the LDR light sensor is effectively good towards the bright light. In which it is relatively bad in conducting towards the dim light. LDR light sensor developed using cadmium sulphide. By embarking light on the sensor causes a greater number of electrons need to be released or electricity with charge to be produced due to inducing cadmium sulphide.

Here in this model, we have had set up an arrangement (Fig.2,3) in a way of facing LDR light sensor in one end of table. This total arrangement was put in a no light area or dark place, so that we can't have any other unnecessary light disturbances. Facilitating the fabric over the same line of placement with a fixed length to the LDR light sensor and the light. This light was kept in one end of table in a fixed dimension and length. In later stage of our model, we needed to pass the light in such a way that it passes through the fabric. When light was exposed on the LDR light sensor there will be a wide change in resistance between two pins. The photo-resistor or LDR gives resistor readings over Arduino [2] IDE, this will be collected and displayed in our result monitor. Now change these types of cloths accordingly to its colours [8] but in the same type of fabric. Recurrently analysing with different cloths of same type of fabrics given us those readings lies on the values mentioned in results sections. After thorough research on same type of fabric, now change the type of fabric to see the variations in resistor readings.

5. Experimental Section

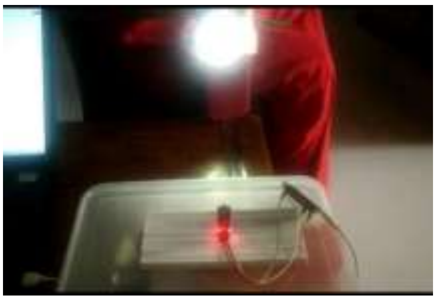

Fig.2: Setup when there is no fabric

Fig.3: Setup when there is a fabric

6. Block Diagram

The Light Dependent resistor is placed in a direction where the light falls over it. Cloth or any fabric stipulated in fixed length between light source and LDR light sensor. A small amount of light falling towards LDR light sensor some amount of electric charge is generated so that resistor values change recurrently. The cadmium sulphide material presents in two pins the resistor variates the charges. When the place is very dim there are number of free electrons expelled to outer atmosphere. So that when light passes through the fabric that light was caught in another end; LDR light sensor, the output in variating of different resistor values is captured in Arduino IDE. (Fig.4)

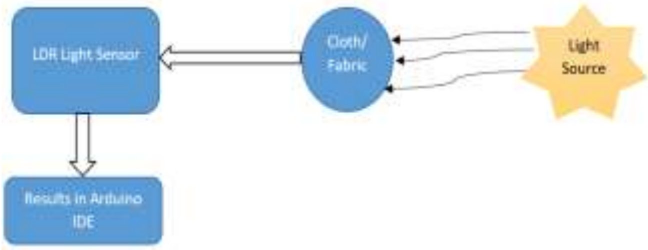

Fig.4: Block Diagram

7. Algorithm

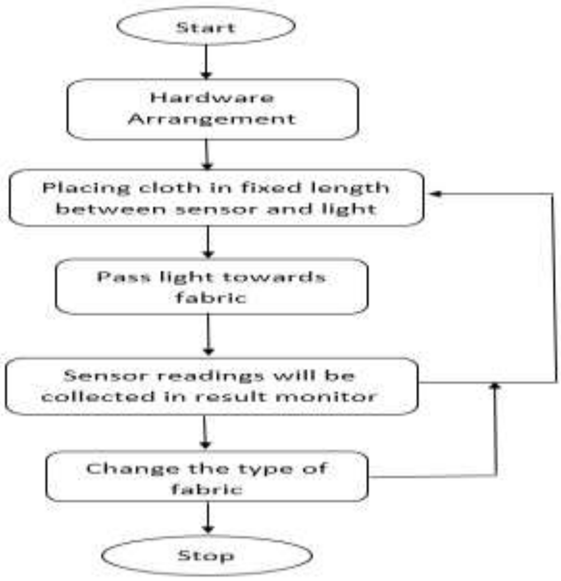

Fig.5: Flowchart

Step 1: Start (Fig.5)

Step 2: Set up the hardware in a line of arrangement given in block diagram.
Step 3: Facilitate the cloth in a same line of placement with a fixed length to the sensor and the light.
Step 4: Pass light thoroughly towards the fabric.
Step 5: The sensor readings will be collected and displayed in our result monitor.
Step 6: Repeat the same steps 3, 4, 5 for better analysis.
Step 7: Now change the type of fabric that is needed to be tested.
Step 8: Repeat step 6.
Step 9: Stop

8. Results

Here fabric variation is implemented using Arduino IDE, after connecting with sensors and some hardware. Every fabric is differentiated in various parameters accordingly to the threading of threads. These makes differentiation when we see with our eye or vision. The fabrics we used for experimental analysis are: Cotton (Fig.6), Crape (Fig.8), Polyester (Fig.10), Net (Fig.12). After performing experimental analysis, we got LDR values: Cotton - 22 volts (Fig.7), Crape - 24 volts (Fig.9), Polyester - 19 volts (Fig.11), Net - 21 volts (Fig.13). Each fabric is identically differentiated by its features. These threading after passing light from one end of fabric is identically varies in these readings of volts mentioned after experimental analysis.

Fig.7: Cotton fabric

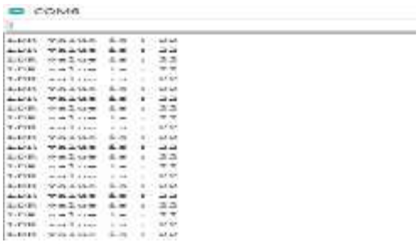

Fig.8: Cotton Values

Fig.9: Crape fabric

Fig.10: Crape Values

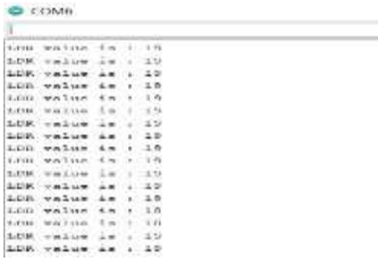

Fig.11: Polyester fabric

Fig.12: Polyester values

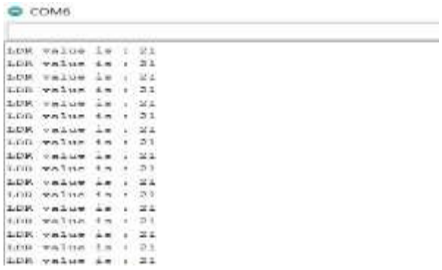

Fig.13: Net fabric

Fig.14: Net values

9. Conclusion

The fabrics have a factor to variate themselves in different ways of experimentation. Here in our model of approach, detailed variation of fabrics was analyzed according to the factor of light dependencies. Totally we have taken 4 types of fabrics where we gave a model of approach to variate between those fabrics. It gives a feasibility of approach to many users for variating the types of fabrics after thorough analysis. Sensor data of LDR was a key for this demo to extract the light passed over fabric.

10. Future Scope

In future, the fabric variation using light dependent factor can be visualized using machine learning. Using machine learning it gives quantified classification of types of fabrics.

11. References

[1] Jin, Rui, and Qiang Niu. "Automatic Fabric Defect Detection Based on an Improved YOLOv5." Mathematical Problems in Engineering 2021 (2021)

[2] Bano, Shahana, G. Lakshmi Niharika, G. V. R. Y. Vamsi, RSK Pavan Kumar, and G. Srinivasa Koushik. "Arduino-Based Plastic İdentification and Picking Robot." In

International Conference on Mobile Computing and Sustainable Informatics, pp. 143-159. Springer, Cham, 2020.

[3] Wang, Xin & Shi, Alex & Zhong, Yueqi. (2019). Fabric Identification Using Convolutional Neural Network. 10.1007/978-3-319-99695-0_12.

[4] Fernández-Caramés, Tiago M., and Paula Fraga-Lamas. 2018. "Towards the Internet of Smart Clothing: A Review on IoT Wearables and Garments for Creating Intelligent Connected E-Textiles" Electronics 7, no. 12: 405. https://doi.org/10.3390/electronics7120405.

[5] Putri, Maharani & Lubis, Solly. (2018). DESIGN OF SECURITY TOOLS USING SENSOR LIGHT DEPENDENT RESISTOR (LDR) THROUGH MOBILE PHONE. International Journal of Innovative Research in Computer and Communication Engineering. 4. 168.

[6] Khan, Ayub & Abir, Nafis & Rakib, Mohammad Abu Nasir & Bhuiyan, E. & Howlader, Md.Ramij. (2017). A Review Paper on Textile Fiber Identification. IOSR Journal of Polymer and Textile Engineering. 04. 14-20. 10.9790/019X-04021420.

[7] Kuo C-FJ, Lee C-L, Shih C-Y (2017) Image database of printed fabric with repeating dot patterns part (I) – image archiving. Text Res J 87:2089–2105 . doi: 10.1177/0040517516663160

[8] Suciati N, Herumurti D, Wijaya AY (2016) Fractal-based texture and HSV color features for fabric image retrieval. In: IEEE International Conference on Control System, Computing and Engineering. pp 178–182.

[9] Wen Y, Zhang K, Li Z, Qiao Y (2016) A Discriminative Feature Learning Approach for Deep Face Recognition BT - Computer Vision – ECCV 2016: 14th European Conference, Amsterdam, The Netherlands, October 11–14, 2016, Proceedings, Part VII. In: Leibe B, Matas J, Sebe N, Welling M (eds). Springer International Publishing, Cham, pp 499–515.

[10] Stoppa, Matteo, and Alessandro Chiolerio. “Wearable electronics and smart textiles: a critical review.” Sensors (Basel, Switzerland) vol. 14,7 11957-92. 7 Jul. 2014, doi:10.3390/s140711957.

[11] Aamer Saleem, Céline Canal, Lee AJ Davis, Roger J Green and David A Hutchins, “Near Infrared Transmission through Various Clothing Fabrics” (2013) J Textile Sci Eng 3: 129.

[12] Silva, Derci & Acosta-Avalos, Daniel. (2006). Light Dependent Resistance as a Sensor in Spectroscopy Setups Using Pulsed Light and Compared with Electret Microphones. Sensors. 6. 10.3390/s6050514.

[13] Goodway, M. (1987). Fiber identification in practice. Journal of the American Institute for Conservation, 26(1), 27-44.