iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 **Issue:** III **Month of publication:** March 2019

DOI: http://doi.org/10.22214/ijraset.2019.3158

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 7 Issue III, Mar 2019- Available at www.ijraset.com

Stillbirth Prevention Using Kick Count Device

Jainam Bajariya[1], Upasi Shah[2], Prof. Himanshu Patel3
[1, 2, 3]*Biomedical Engineering Department, U.V. Patel College of Engineering*

Abstract: ***Women who are continuously hustling around do not have ample amount of time to count the kicks and that often leads to death of baby due to some complication [1]. To overcome this hurdle, we are proposing a device that can be attached with pregnancy support belt and hence measures the kicks continuously. The idea is to use the piezoelectric PVDF film for sensing the movements. This portable fetal kick monitor could help to reduce the rate of stillbirths. The idea is to improvise the ergonomy and patient comfort by continuously measuring the movements of pre-natal baby.***

Keywords: Fetus- An unborn or unhatched offspring of a mammal, an unborn human more than eight weeks after conception.
Doppler: A Doppler fetal monitor is a hand-held ultrasound transducer used to detect the fetal heartbeat for prenatal care.

Stillbirth: Stillbirth is typically defined as fetal death at or after 20 to 28 weeks of pregnancy. It results in a baby born without signs of life.

PVDF: Polyvinylidene fluoride or polyvinylidene difluoride Primigravida - A woman who is pregnant for the first time.

Primigravida: A woman who is pregnant for the first time.

I. INTRODUCTION

Stillbirths have a major role in the rate of prenatal deaths, yet they largely remain invisible. Stillbirths are one of the most important, yet most poorly understood and recognized adverse outcomes of pregnancy [2]. Worldwide, 2·65 stillbirths occur yearly, out of which 98% occur in countries having low and middle income [3]. Despite the fact that more than forty fifth of the worldwide burden of stillbirths occur intrapartum, the perception is that little is known regarding effective interventions [4], particularly those who may be enforced in low-resource settings. Fetal Movement is a marker for evaluating wellbeing of the unborn baby. ACOG bulletin stated that "10 distinct movements in a period of up to 2 continuous or interrupted hours is considered reassuring [5]. A non-reassuring count should prompt notification for further fetal assessment."

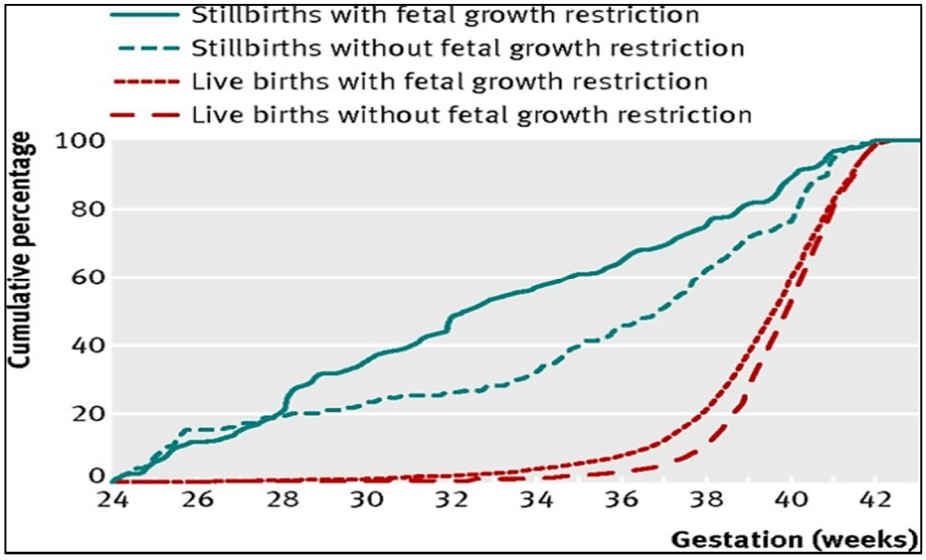


Fig.1 Causes of stillbirth

Naturally, pregnant women can sense any movement in her abdomen. However, there are two groups of women who may have degraded this sensing ability. A primigravida, a first-time pregnant woman, may not be able to recognize the fetal movement and a working pregnant woman may be too busy to aware of her fetal responses. Therefore, a portable fetal kick monitor could help to reduce the number of stillbirths. The signal can be processed before uploaded into internet cloud services for real-time monitoring and remote access.

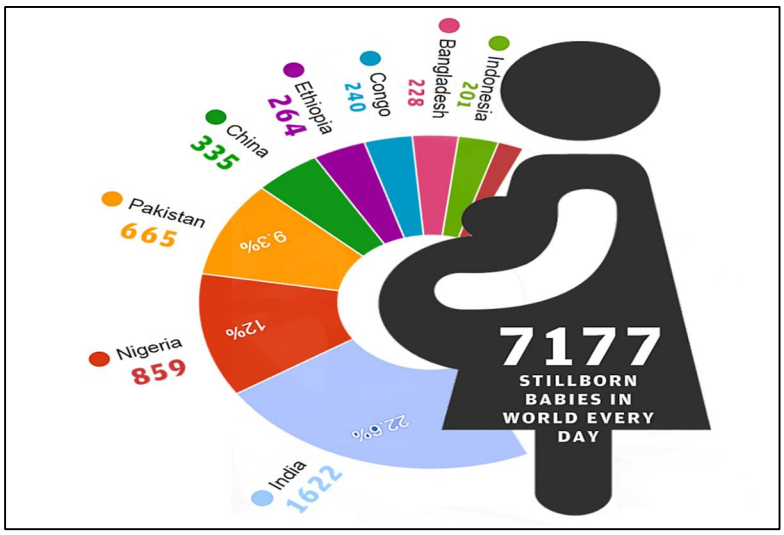


Fig. 2 Rate of stillbirths worldwide

II. CURRENT METHODOLOGY

It is not known how much time is needed for a baby to die in foetus. Fetal behaviour is consistent and a change in the baby movements or sleep cycles can indicate fetal complications [6]. Fetal complications or death are often confirmed via fetoscopy, ultrasound, or electronic fetal monitoring. The principle of this method is to create an image of the foetus in the mother's uterus using the Doppler Effect. The fetal heart Doppler uses a transducer to emit and receive continuous ultrasonic sound waves [7]. This technique can usually pick up the fetal heartbeat after 8 weeks gestation. For gynaecological studies, ultrasonic frequency of about 2 to 2.5 MHz is typically used. Counting of Fetal movement has been suggested as a screening tool to identify impaired placental function [8]. Observing the intrauterine movements of the foetus is a basic method to evaluate the health of the baby. Such a movement may be from many responses such as kicking, turning around or flexing.

III. A NEW APPROACH TO PREVENT STILLBIRTH

Piezoelectric sensors created by piezoelectric ceramics e.g. polyvinylidene fluoride (PVDF) are to measure vibrations. PVDF has excellent properties such as outstanding chemical resistance, high thermal stability, low permittivity's, low acoustic impedances, flexibility and membrane forming properties [9]. Physical activities can generate vibrations on the surface of the body. These vibrations can be measured by placing sensors to skin surface, which means portable medical detections. PVDF sensors are helpful due to its flexibilities, low costs and lightweights in this area. The sensor can be placed such on the mother womb that it records the movements of the foetus. It can be placed on the pregnancy support belt and that way it continuously monitors the fetal movements. The adaptive filters can be used to remove the artefacts and other unwanted signals and obtain kick signals.

IV. OUR IMPLEMENTATION

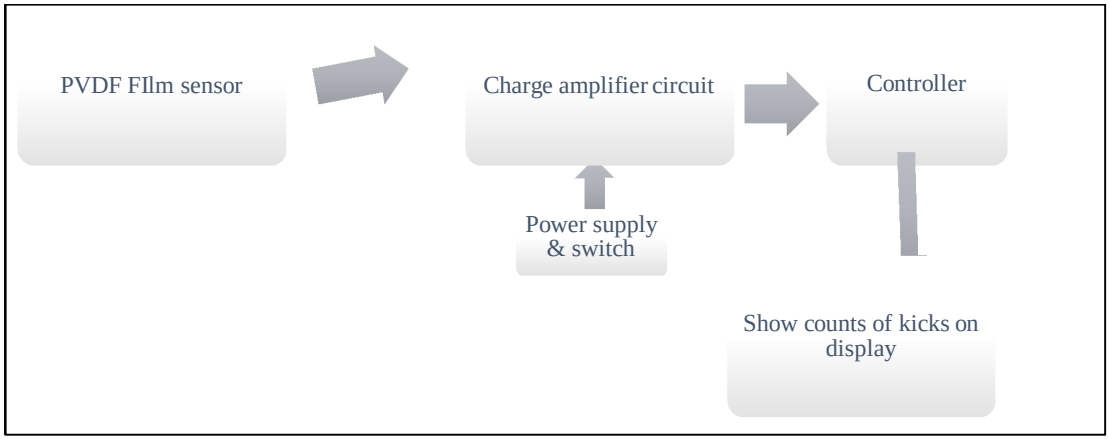


Fig. 3 Block diagram of Kick count device

A. PVDF Film Sensor

Piezo film, like all piezoelectric materials, may be a dynamic material that develops an electrical charge proportional to a modification in mechanical stress [10]. The electrical charges developed by piezo film decay with a time constant that's determined by the non-conductor constant and therefore the internal resistance of the film, as well as the input electrical resistance of the interface electronics to which the film is connected [11].

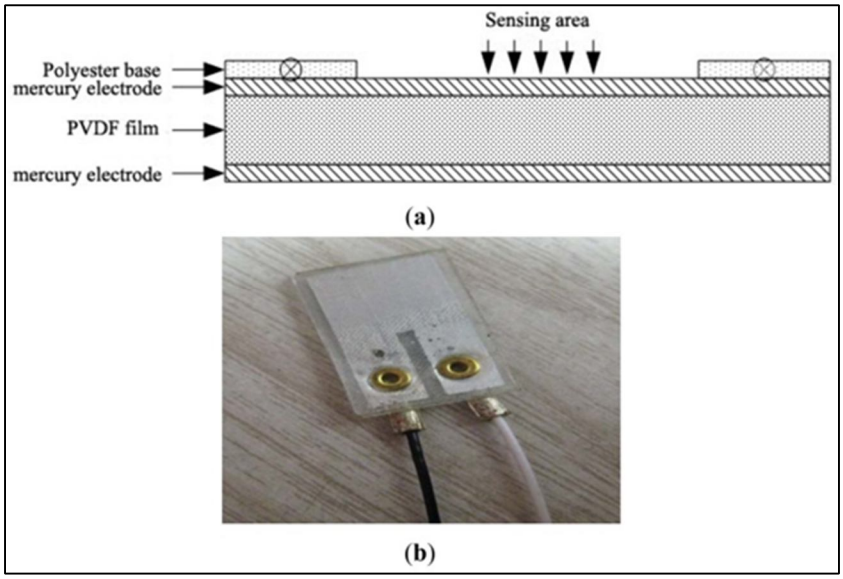


Fig. 4 PVDF film sensor

B. Charge Amplifier

We constructed a circuit of charge amplifier which is used to match the high impedance of PVDF film and it allows the good communication between connecting cable and film as the cable has its own resistance [12]. The charge amplifier is a current operated circuit with zero input electric resistance, which ends up in no voltage being generated across the film. It absorbs all the charges quickly that are developed by the deflection of the film.

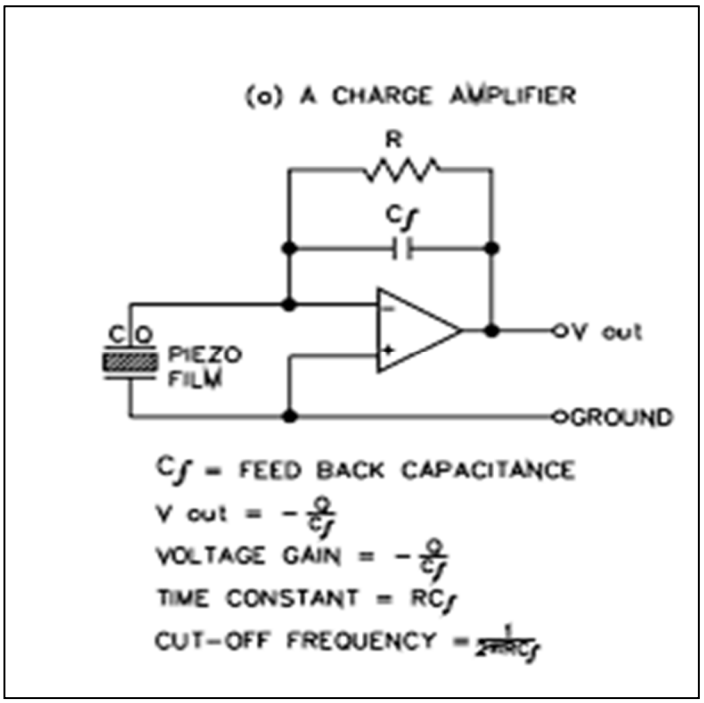


Fig. 5 Charge amplifier

V. OBSERVATIONS AND RESULTS

Fig. 6 Circuit of charge amplifier constructed by us

We constructed a charge amplifier circuit using an Op-amp 741 IC and taking the pulse form a circuit made in proteus software. After simulating it we observed that whenever a pulse is given to the sensor, a spike is observed in the oscilloscope and that spike is amplified using this charge amplifier for further processing of the signal. From these observations we constructed a table and a graph showing the input output characteristics of the PVDF sensor.

Table 1.
I/P O/P characteristic of PVDF sensor

Sr. No.	I/P Voltage (Impulse)	O/P Voltage
1.	10mv	0.1V
2.	50mv	4.85V
3.	100mv	9.83V
4.	200mv	10.15V
5.	500mv	10.55V

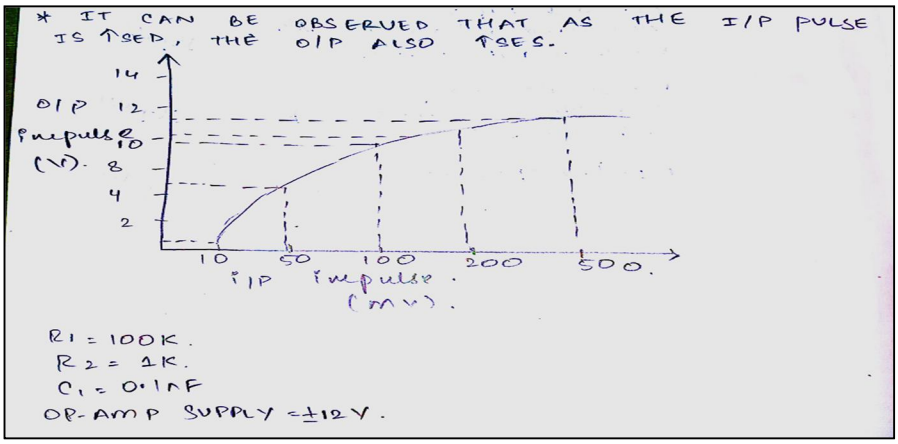


Fig. 7 Graph showing the input output relation of sensor

After such trials it was observed that the spikes can me modulated and conditioned in order to count them digitally. These results were satisfactory to proceed to a further stage.

VI. FUTURE EXPANSIONS

As compared to the current technology such as Doppler Ultrasound, our proposed idea is applying the passive technique. Neither mechanical nor electrical energy is used to disturb the intrauterine environment. So, we would further like to develop a filtering as well as comparator circuit that could count the number of kicks of the baby and compare it with the pre-set number of kicks (10 kicks). If any abnormality in the number of kicks is observed than automatically an alarm is triggered. So, the mother as well as doctor gets alert about the abnormality. Moreover, a feature to wirelessly transmit the data to the physician will also be included which makes the treatment better.

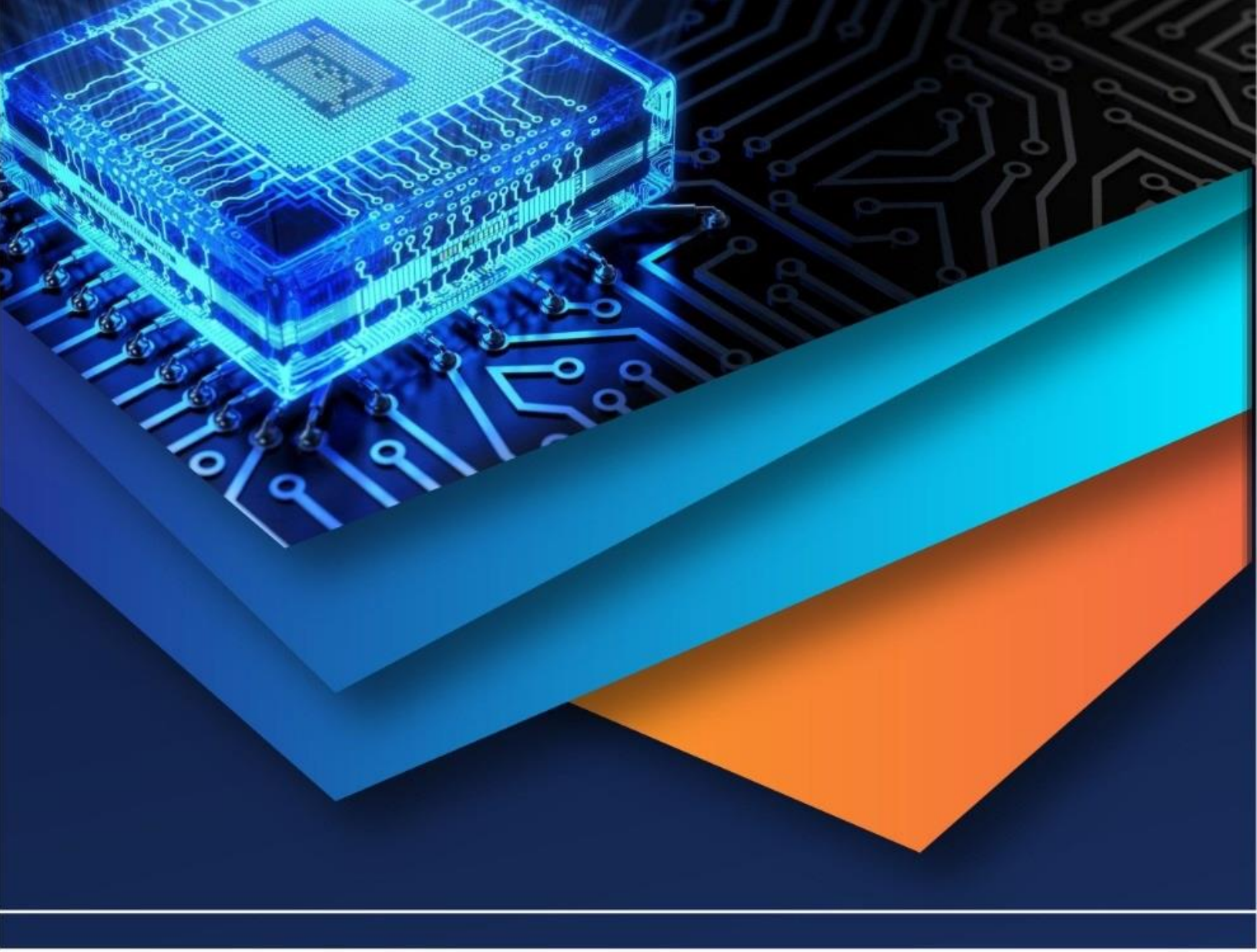
VII. CONCLUSION

This portable fetal kick count device could help to cut the number of stillbirths. The idea of our proposal is to improvise the ergonomy and patient comfort by continuously monitoring the movements of pre-natal baby. We can put this device on the pregnancy support belt which is usually wore on the abdomen using double sided tapes.

REFERENCES

[1] Baby center, https://www.babycenter.in/thread/1633071/terminating-my-pregnancy-due-to-some-complication
[2] Lancet journal, Stillbirths: what difference can we make and at what cost? Prof Zulfiqar A Bhutta, PhD, Mohammad Yawar Yakoob, MBBS, Joy E Lawn, PhD, Arjumand Rizvi, MSc, Ingrid K Friberg, PhD,Eva Weissman, PhD,https://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736(10)62269-6.pdf
[3] Ecommoms- aga khan university https://ecommons.aku.edu/pakistan_fhs_mc_women_childhealth_paediatr/615/
[4] Ota, Erika & Souza, João & Tobe, Ruoyan & Mori, Rintaro & Middleton, Philippa & Flenady, Vicki. (2012). Interventions during the antenatal period for preventing stillbirth: an overview of Cochrane systematic reviews (Protocol). Cochrane database of systematic reviews (Online).,https://www.researchgate.net/publication/237052456_Interventions_during_the_antenatal_period_for_preventing_stillbirth_an_overview_of_Cochrane_systematic_reviews_Protocol
[5] Keyword suggest tool,https://www.keyword-suggest-tool.com/search/acog+fetal+kick+counts/
[6] The International Organization of Scientific Research (IOSR), Non Diabetic Hypoglycemia: A Rare Cause of Still Birth, Dr.Archana Prasad Kapavarapu (post graduate ,)Dr.Shashikant Kulkarni (Head of the Department),d.y patil hospital and research institute, Kolhapur.,http://www.iosrjournals.org/iosr-jdms/papers/Vol15-Issue%2011/Version-1/I1511014547.pdf
[7] Indiamart store,https://www.indiamart.com/proddetail/fetal-doppler-13922510262.html
[8] BMC pregnancy and childbirth,https://bmcpregnancychildbirth.biomedcentral.com/track/pdf/10.1186/1471-2393-12-124?site=bmcpregnancychildbirth.biomedcentral.com
[9] Xin, Yi & Sun, Hongshuai & Tian, Hongying & Guo, Chao & Li, Xiang & Wang, Shuhong & Wang, Cheng. (2016). The use of polyvinylidene fluoride (PVDF) films as sensors for vibration measurement: A brief review. Ferroelectric,https://www.researchgate.net/publication/309708840_The_use_of_polyvinylidene_fluoride_PVDF_films_as_sensors_for_vibration_measurement_A_brief_review
[10] Mafiadoc.com,https://mafiadoc.com/piezo-film-sensors-technical-manual-sparkfun-electronics_59ef6fc11723dd2094878252.html
[11] Mafiadoc.com,https://mafiadoc.com/piezo-film-sensors-technical-manual-sparkfun-electronics_59ef6fc11723dd2094878252.html
[12] Solarpanelsavenue.com,https://solarpanelsvenue.com/free-solar-cable-size-calculator/

\



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY