GREATER SAN DIEGO SCIENCE & ENGINEERING FAIR (GSDSEF)

PROJECT PROPOSAL/SIGNATURE* FORM (GSDSEF-1, 2015)

This form must be completed and signed prior to starting project work. It must be placed in the student's notebook with an ABSTRACT OF THE PROJECT for the GSDSEF Screening Fair. (Use the "Tab" key to move from line to line)

1. Project Title Spinning Mirror Holographic Display

Is this a continuation of a previous project? ☐ Yes ☑ No

2. STUDENT'S NAME (Last, First, Middle) Kalita, Nikhil

2a. Partner's Name (for Senior Division 2 person projects only) _____

EACH SENIOR DIVISION PARTNER MUST SUBMIT A SEPARATE PROJECT PROPOSAL FORM.

3. Address, City, Zip 11298 Breckenridge Way, San Diego, CA 92131

4. Phone (858) 602-2472 **email** nikhil.kalita@gmail.com

5. School Marshall Middle School **Grade** 8

6. Teacher Elaine Gillum

7. This project involves (check all that apply):

- ☐ **Live Vertebrate Animals** (GSDSEF-2, 2015)
- ☐ **Humans as subjects, helpers, or interviewees** (GSDSEF-3, 2015)
- ☐ **Hazardous Substances (anything that could cause injury)** (GSDSEF-4, 2015)
  - ☐ **Chemicals**
  - ☐ **Infectious Agents**
  - ☐ **Bacteria, Fungi and/or Molds**
  - ☐ **Mutagenic Agents**
  - ☐ **Carcinogenic Agents**
  - ☐ **Teratogenic Agents**
- ☐ **Human or Other Vertebrate Tissue** (GSDSEF-5, 2015)

8. WHERE REQUIRED (see #7 above), the following supplemental forms must be completed and included with the project proposal form (CHECK ALL THAT APPLY):

- ☐ *Certification of Humane Treatment of Live Vertebrate Animals* (GSDSEF-2, 2015)
- ☐ *Certification of Compliance of Research Involving Humans* (GSDSEF-3, 2015)
- ☐ *Certification of Hazards Control* (GSDSEF-4, 2015)
- ☐ *Certification of Vertebrate Tissue Source & Safety* (GSDSEF-5, 2015)

9. Location where experimental procedures will take place: Experimenter's home.

10. People, companies, etc. providing equipment, materials, workspace: None.

11. Describe, in 200 – 250 words, the planned project/experiment and the procedures to be used:

The goal of the experiment is to create a low-cost three-dimensional volumetric display like the ones shown in science-fiction movies. Similar experiments have been conducted in academia and in the industry but with custom, expensive components. The plan for this project is to use cheap, off-the-shelf components and develop a simple design through experimentation. This will help proliferate such display technology broadly among the world population and add a third dimension to important use-cases such as remote-training, video-conferencing, on-line shopping and more.

The setup will involve 4 main components, namely, a consumer-grade tablet, a high-speed stepper-motor, a mirror with anisotropic diffuser mounted at 45 degrees on the spinning motor and a programmable micro-controller. The tablet will cycle through 4 different views of a scene or object. The spinning mirror will be synchronized with the tablet so that a viewer facing the setup from any of the four sides will observe only that view of the scene or object. The experiment will require using a suitable high-speed stepper motor, measuring the display frame rate using a photo-detector, measuring the motor-speed using a infra-red sensor and adjusting the motor-speed on-the-fly to maintain synchronization. The display frames will be a canned sequence of images compiled into a video-file using easily available PC software. The video frame rate will need to be in the range of the maximum speed achievable by the loaded stepper motor. The default motor rotational control step-delay and the dynamic step adjustment will be determined by this experiment.

Just before the screening fair, attach a 200-250 word ABSTRACT of your project to this form.

*Continue to next page for required Signatures

GREATER SAN DIEGO SCIENCE & ENGINEERING FAIR
(GSDSEF) PROJECT PROPOSAL/SIGNATURE FORM (GSDSEF-1, 2015)
REQUIRED SIGNATURES:

Student:

I have read the *Rules and Regulations* of the GREATER SAN DIEGO SCIENCE AND ENGINEERING FAIR and certify that my project complies with them. I understand that failure to meet the terms of these rules and regulations will result in the disqualification of my project.

SENIOR DIVISION: GSDSEF forms meet the requirements of California law; therefore, all Senior Division students agree that, should they be selected to compete at the 2015 *Intel International Science and Engineering Fair (Intel ISEF)*, when they sign all required *Intel ISEF* forms they will predate them to agree with the date on this form.

Nikhil Kalita 9/1/14

Student Signature/Date

Parent/Guardian:

I am aware of all potential safety hazards connected with this project, approve the precautions being taken to ensure my student's safety and will, when appropriate, provide guidance and/or supervision. I understand that failure to comply with *Rules and Regulations* of the GREATER SAN DIEGO SCIENCE AND ENGINEERING FAIR will result in the disqualification of the project.

9.1.14

Parent Signature/Date

Teacher:

I approved this project prior to the student beginning work on it and verified that it complies with the *Rules And Regulations* of the GREATER SAN DIEGO SCIENCE AND ENGINEERING FAIR. Any concerns about the project's design, appropriateness, safety, or legality were submitted to the GSDSEF Scientific Review Committee (SRC) for approval prior to allowing the student to proceed. I understand that failure to comply with the Fair's *Rules And Regulations* will result in the disqualification of the project. I will provide all needed supervision (other than that specified on other included forms) and will ensure that this proposal and all required supplemental forms are included in the student's notebook at the screening fair. I will have the student, if invited to apply for entrance to the GSDSEF, submit all SRC requested certification forms with their *2015 Application for Entrance.*

9-1-14

Teacher Signature/Date

Additional Advisor (if required)

When certification forms (*GSDSEF 2, 3, 4* or *5*, 2015) are signed by someone in addition to the science teacher, a signature here ensures that the procedures described on these forms will be followed.

Additional Advisor Signature/Date