VIRTUAL LAB

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ACKNOWLEDGEMENT

We are very thankful to **“Ministry of Human Resource Development ”, Government of India, New Delhi** for providing financial support to develop Virtual Lab Experiment in 3D.

VIRTUAL LAB:

Well defined steps to carry out the experiment or work sequentially. Result can not be obtained if steps are not perform sequentially or carelessly.

VIRTUAL ENVIRONMENT:

Freedom for user to move in any direction and can do list of works not necessary sequentially.

VIRTUAL LAB

- To provide remote-access to Labs in various disciplines of Science and Engineering.

- To enthuse the students to conduct experiments by arousing their curiosity.

- To provide a complete Learning Management System- web-resources, video-lectures, animated demonstrations and self evaluation

- To share costly equipment and resources, which are otherwise available to limited number of users due to constraints on time and geographical distances

SALIENT FEATURES

- 3D virtual lab is very cost effective as instrument is required only one time for image capturing
- No breakage, wear and tear of instrument
- Very useful in education as less resources are required
- Remotely accessibly learning system
- Many users can download the file simultaneously and perform the experiment offline also

APPLICATIONS

- Enhances E- learning and quality of education
- Learning in 3D environment
- Anywhere, anyplace

USERS

- Students- UG and PG level
- Research Scholar
- Faculty Staff
- Novice Users

Virtual lab available at-
http://www.vlabcivil-iitr.co.in

REQUIREMENT OF HARDWARE AND SOFTWARE

Software Requirement-

•32 bit or 64 bit, Windows XP sp2 or higher version

•Microsoft Internet Explorer 8.0 internet browser or higher or Mozilla Firefox 3.0 internet browser or higher (Google Chrome recommended)

•Flash Player

•Internet connection for web downloads

Hardware Requirement-

•Intel Core 2 Duo Processor or equivalent AMD processor or higher

•2 GB RAM (4 GB recommended)

•OpenGL-capable graphics card (256 MB or higher video card memory, 1 GB or higher recommended)

EXPERIMENTS DEVELOPED

1) Study of various parts of Auto Level and Carry out Fly Leveling using Auto Level.

2) Carry out Profile Leveling using Auto Level.

3) Observations of Vertical and Horizontal angles using Total Station.

4) Study of Plane Table and its Accessories.

5) Detail Plotting by Radiation Method (in 2D).

Continued…

EXPERIMENTS DEVELOPED

6) Detail Plotting by Intersection Method (in 2D).

7) Detail Plotting by Resection Method (in 2D).

8) Carry out Contouring in the field (in 2D)..

9) Study of Global Positioning System (GPS) and its Accessories.

10) Observations using GPS.

TOOLS USED FOR DEVELOPING EXPERIMENTS

For 3D Development-

- Autodesk 3ds Max 9
- Adobe Photoshop CS4
- Quest 3D version 4.3.2

For 2D Development-

- Adobe Flash CS5
- Adobe Photoshop CS5

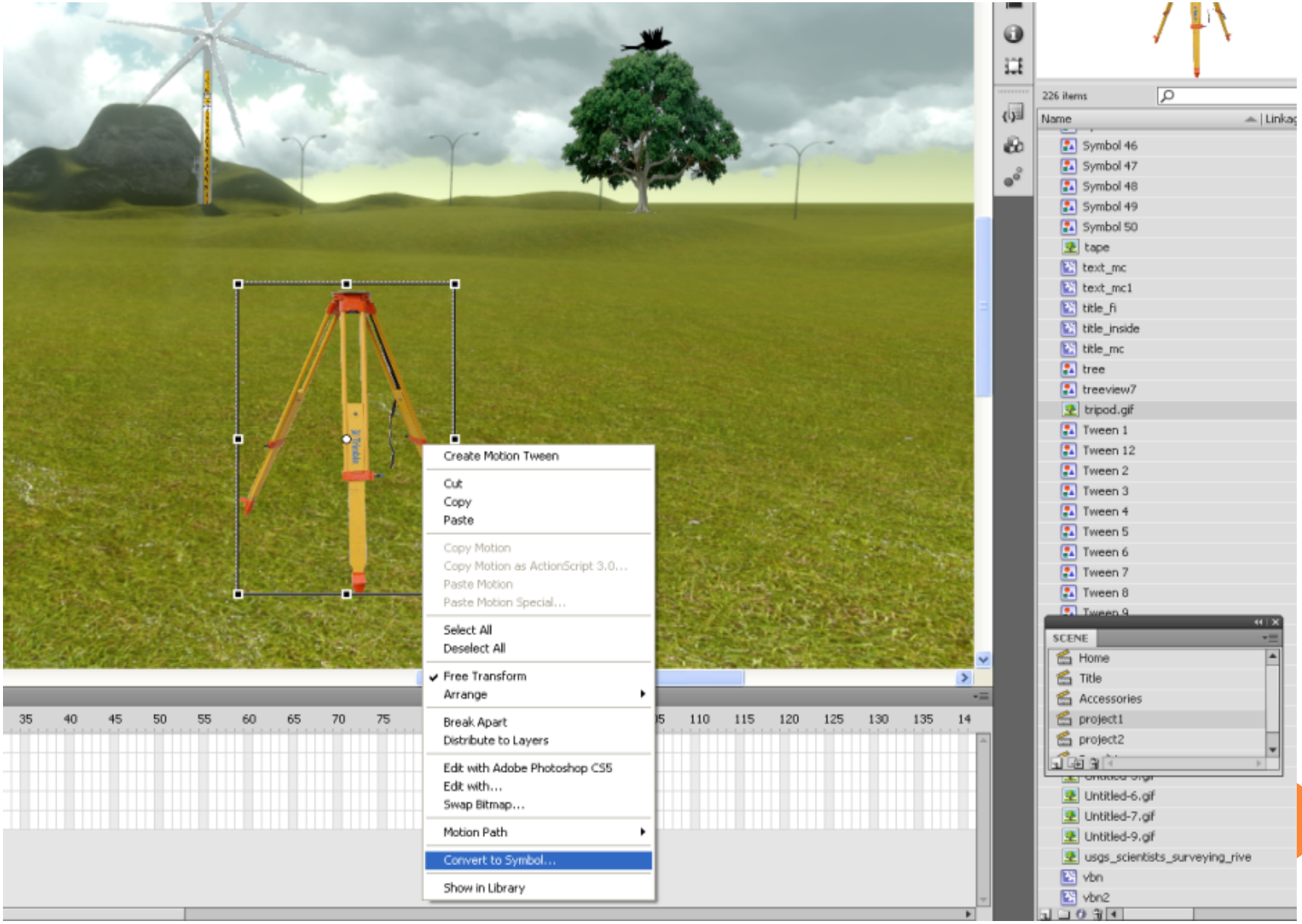
For Website Development-

- PHP
- MySql
- JavaScript
- AJAX

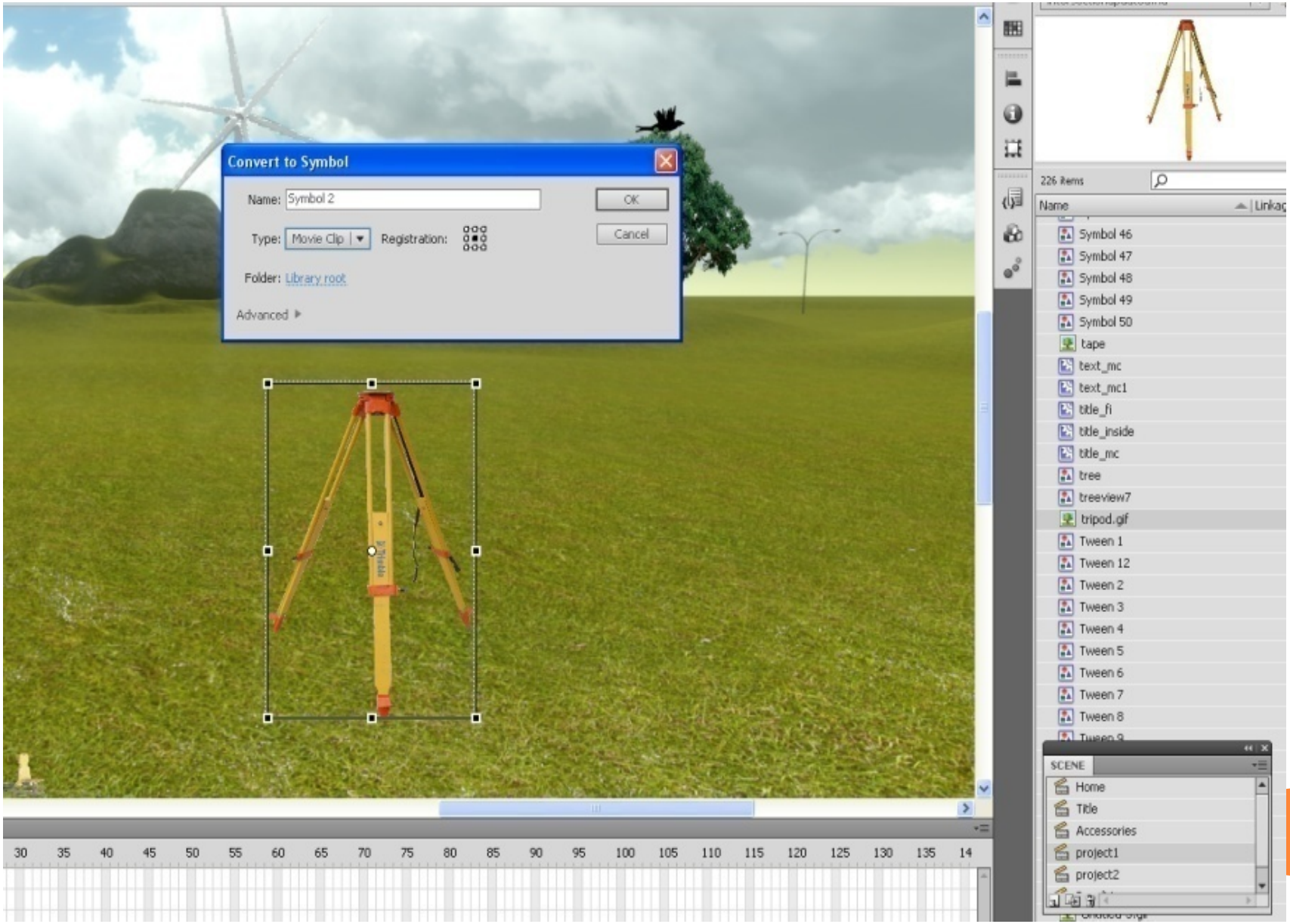
METHODOLOGY FOR 2D DEVELOPMENT

1) Taking Images and measurements and design sketches

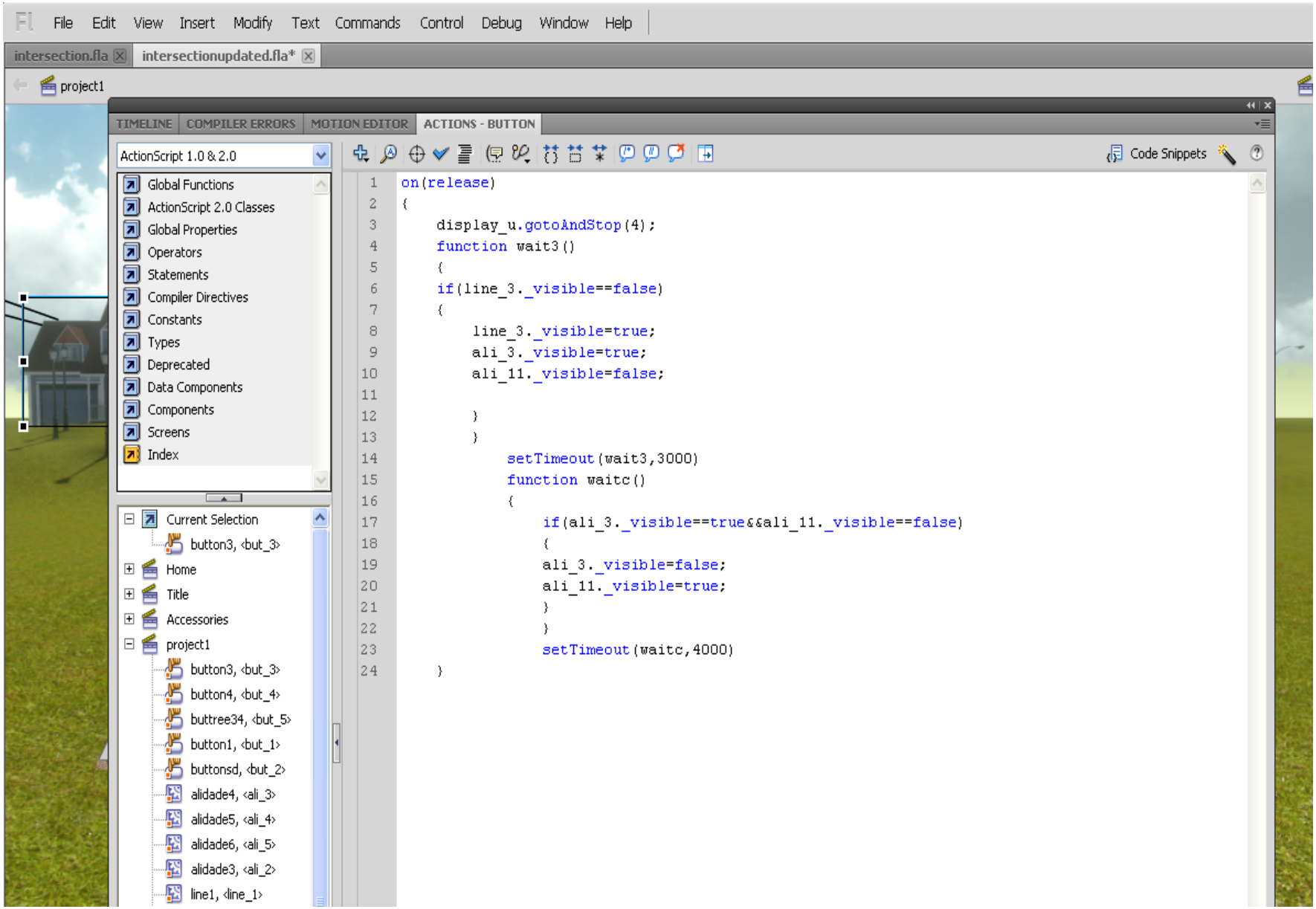
2) a. Designing and placing 2D Objects in the field



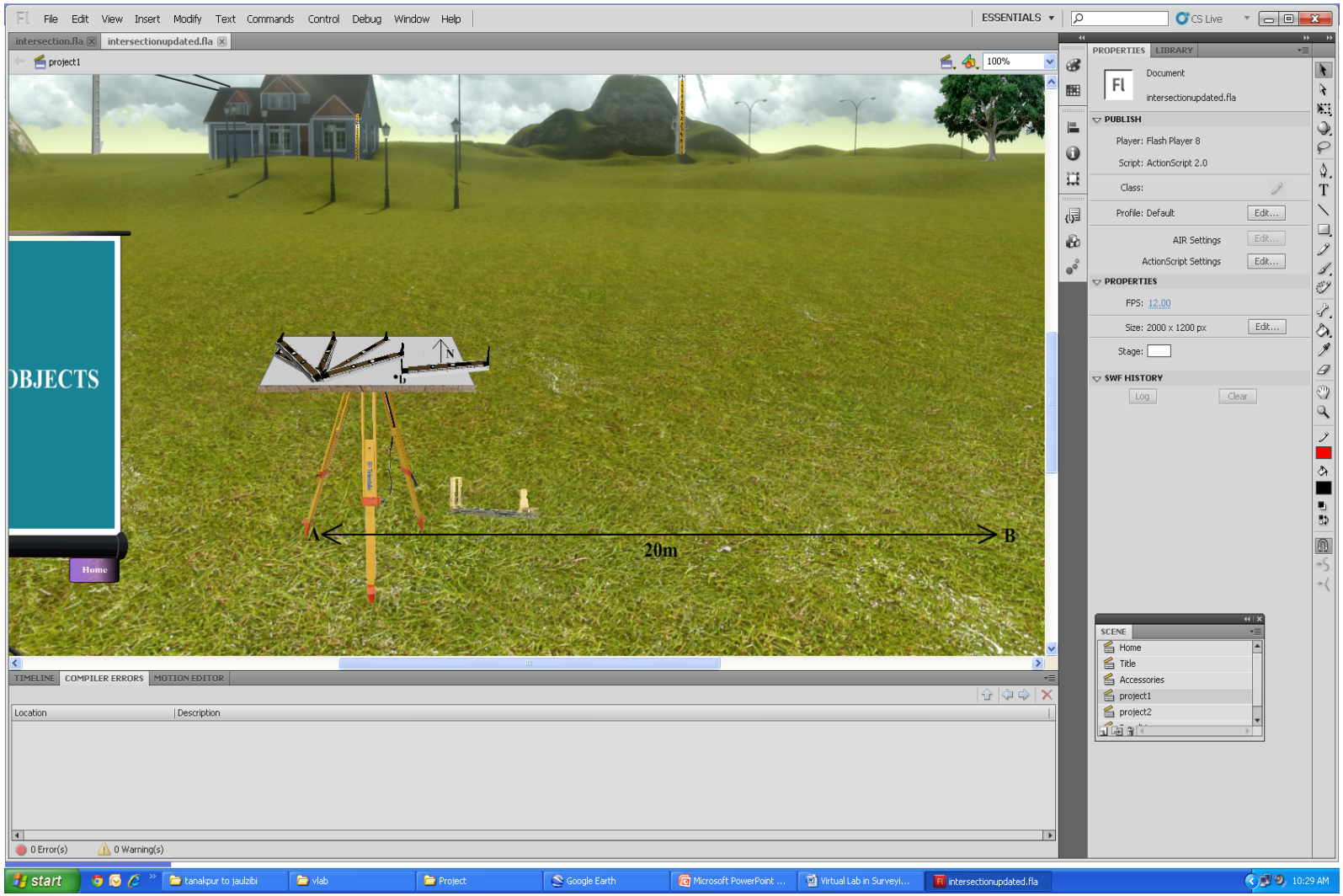
2) a. Designing and placing 2D Objects in the field



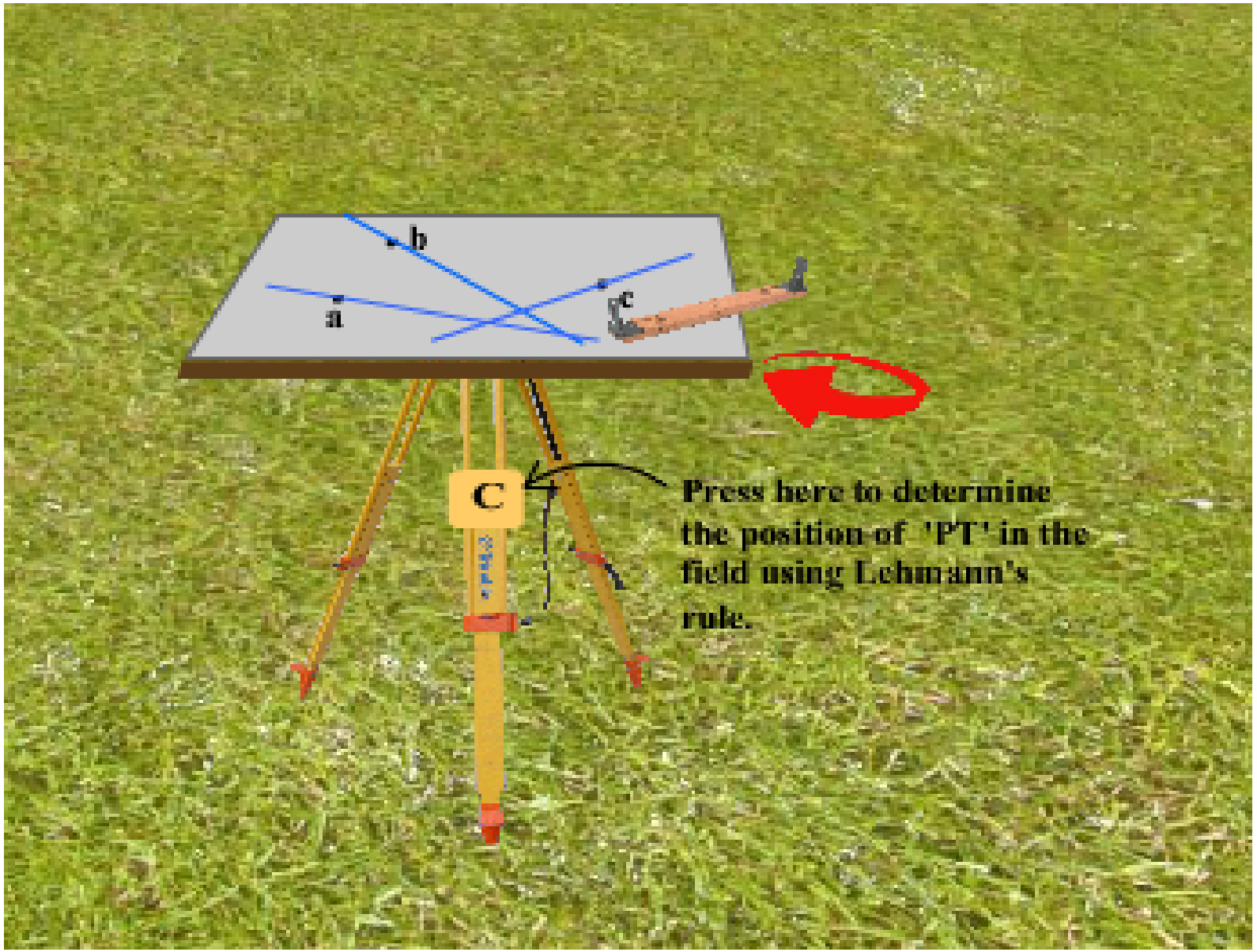
2) b. Coding in Flash



3) Placing Objects in the field

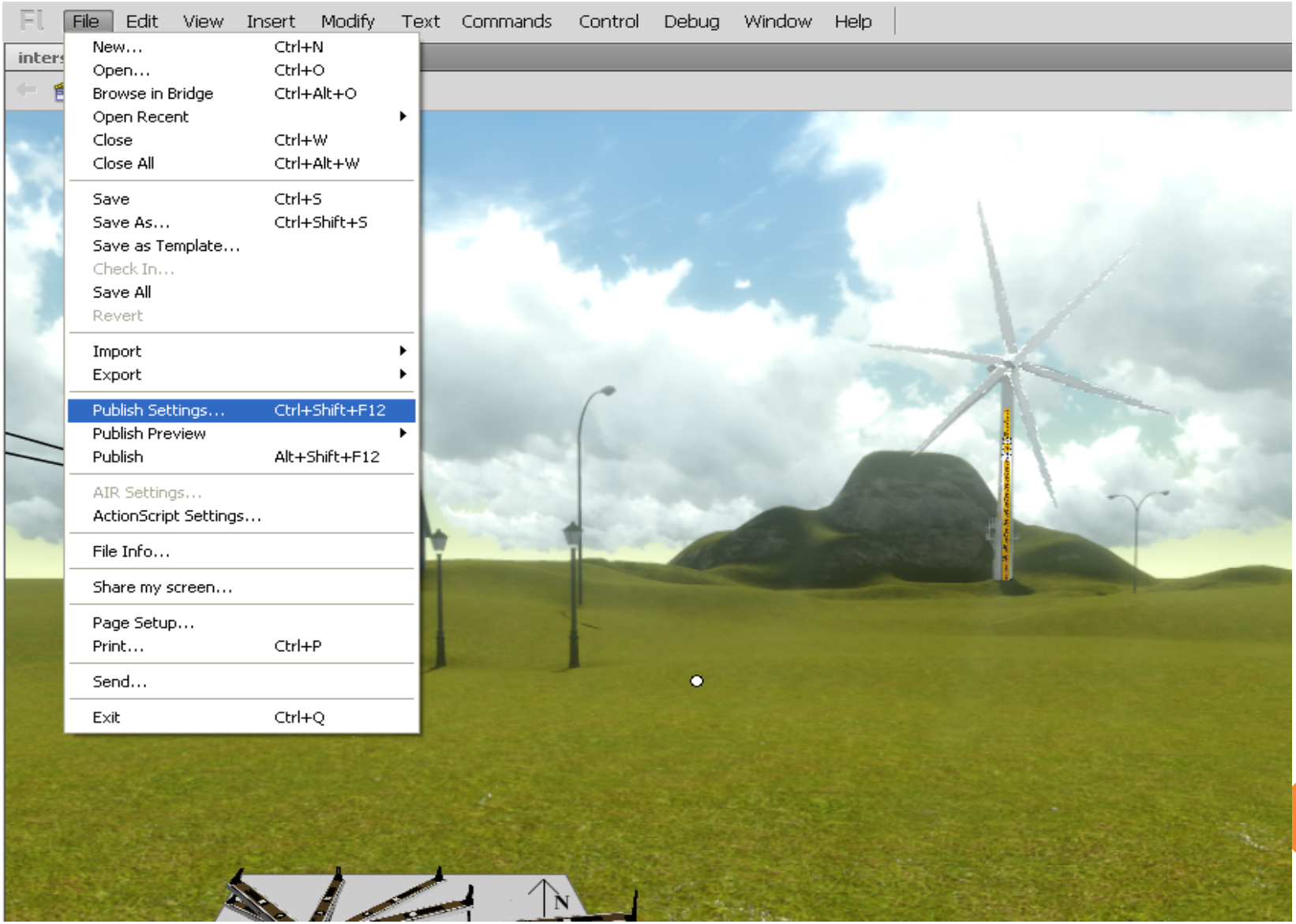


4) Instructions on screen to perform

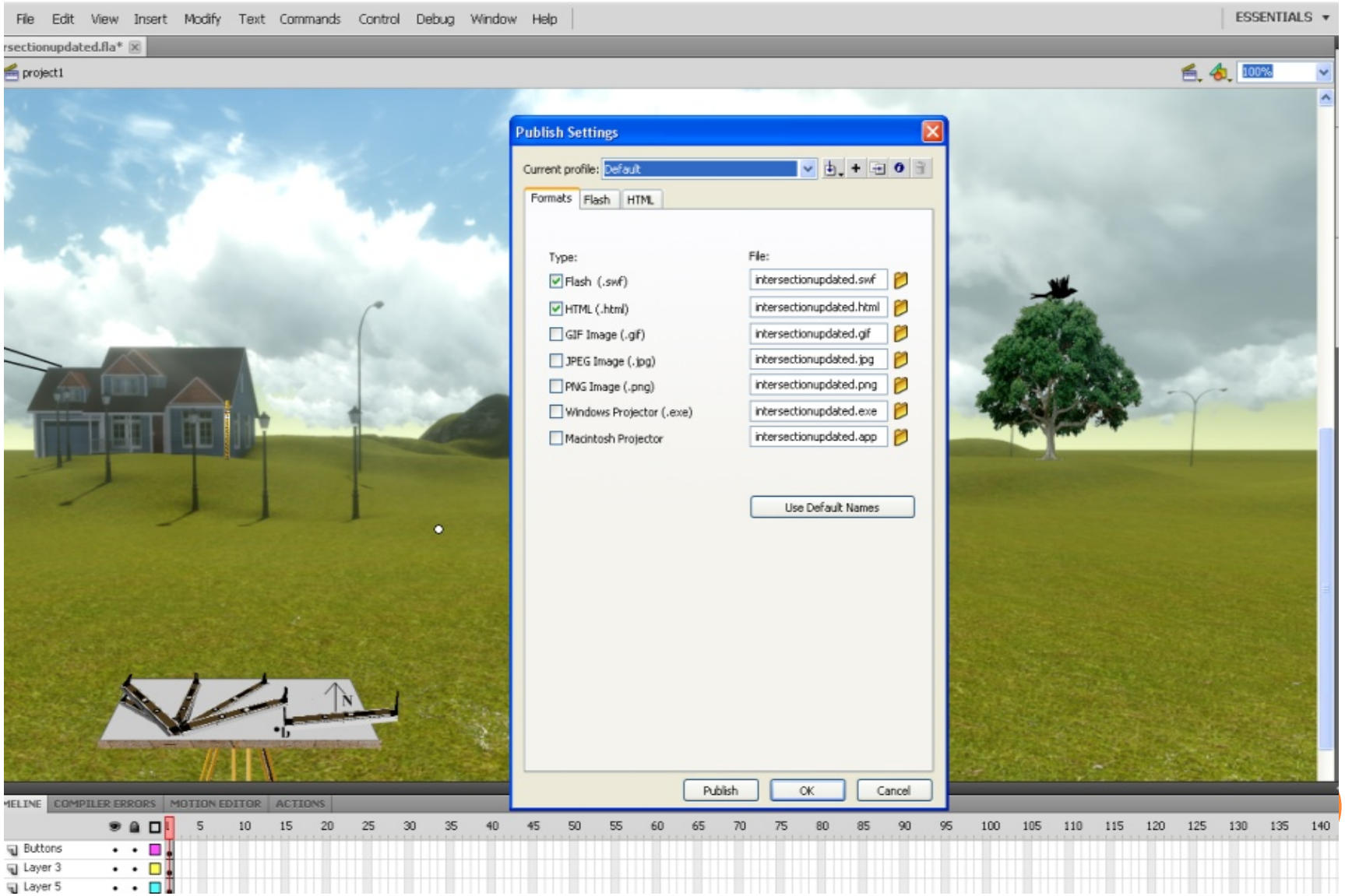


4) Instructions on screen to perform

5) Generation of flash file for standalone system

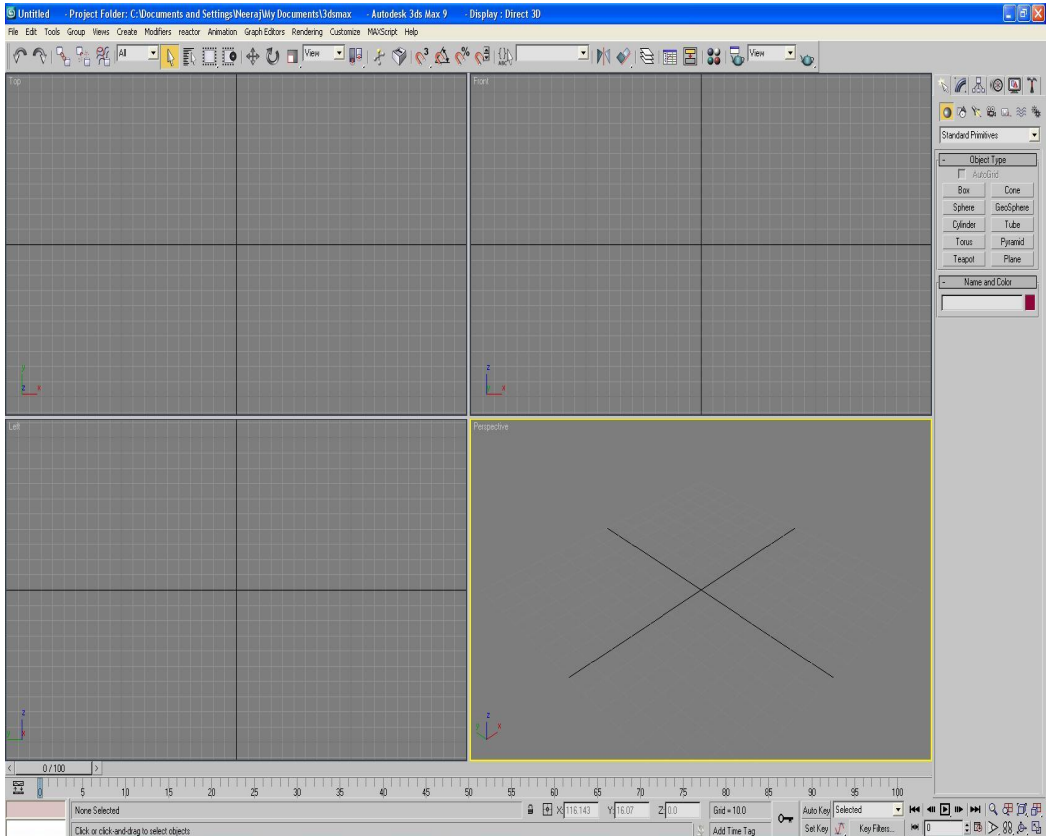


5) Generation of flash file for web compatible for online purpose

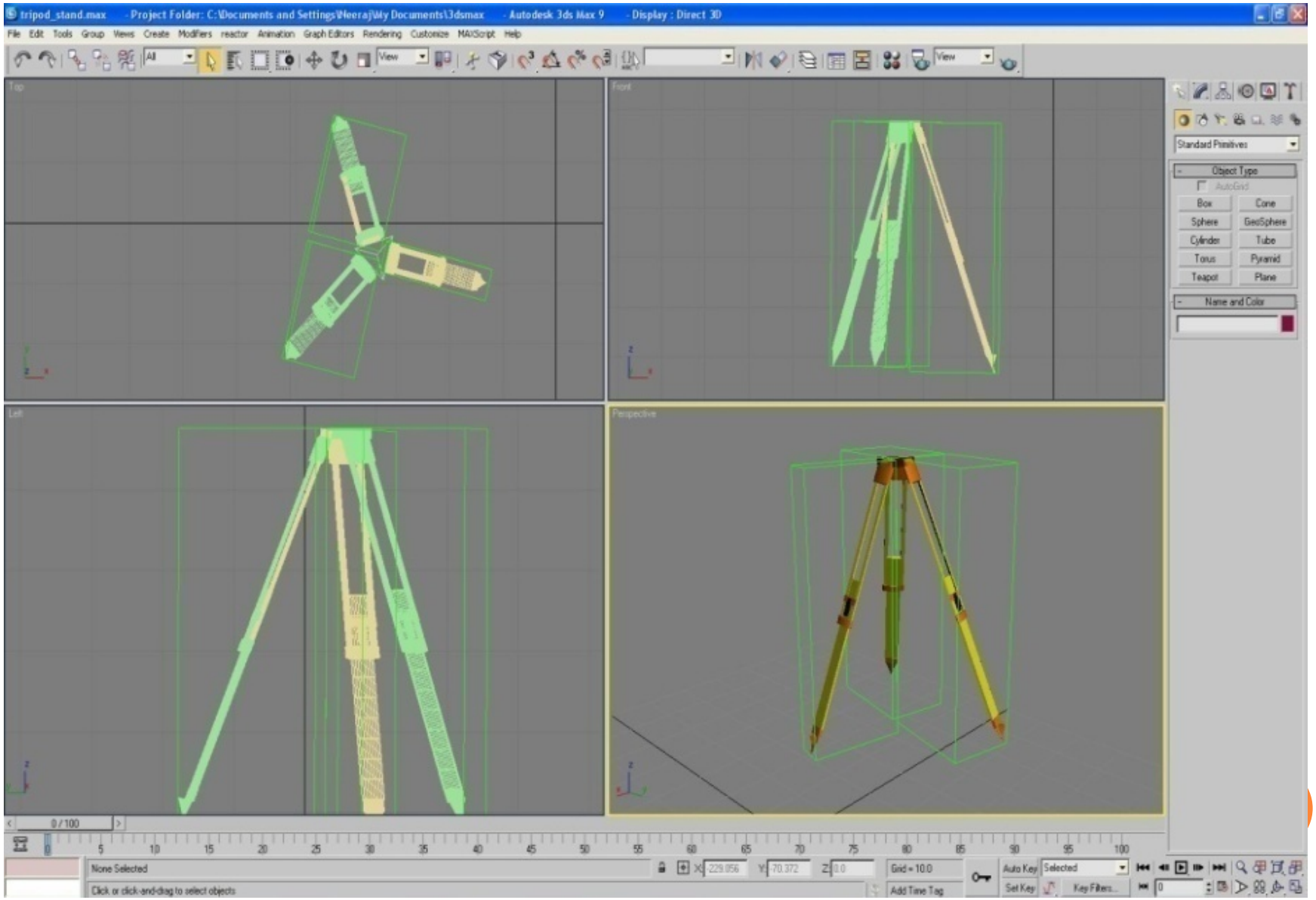


METHODOLOGY FOR 3D DEVELOPMENT

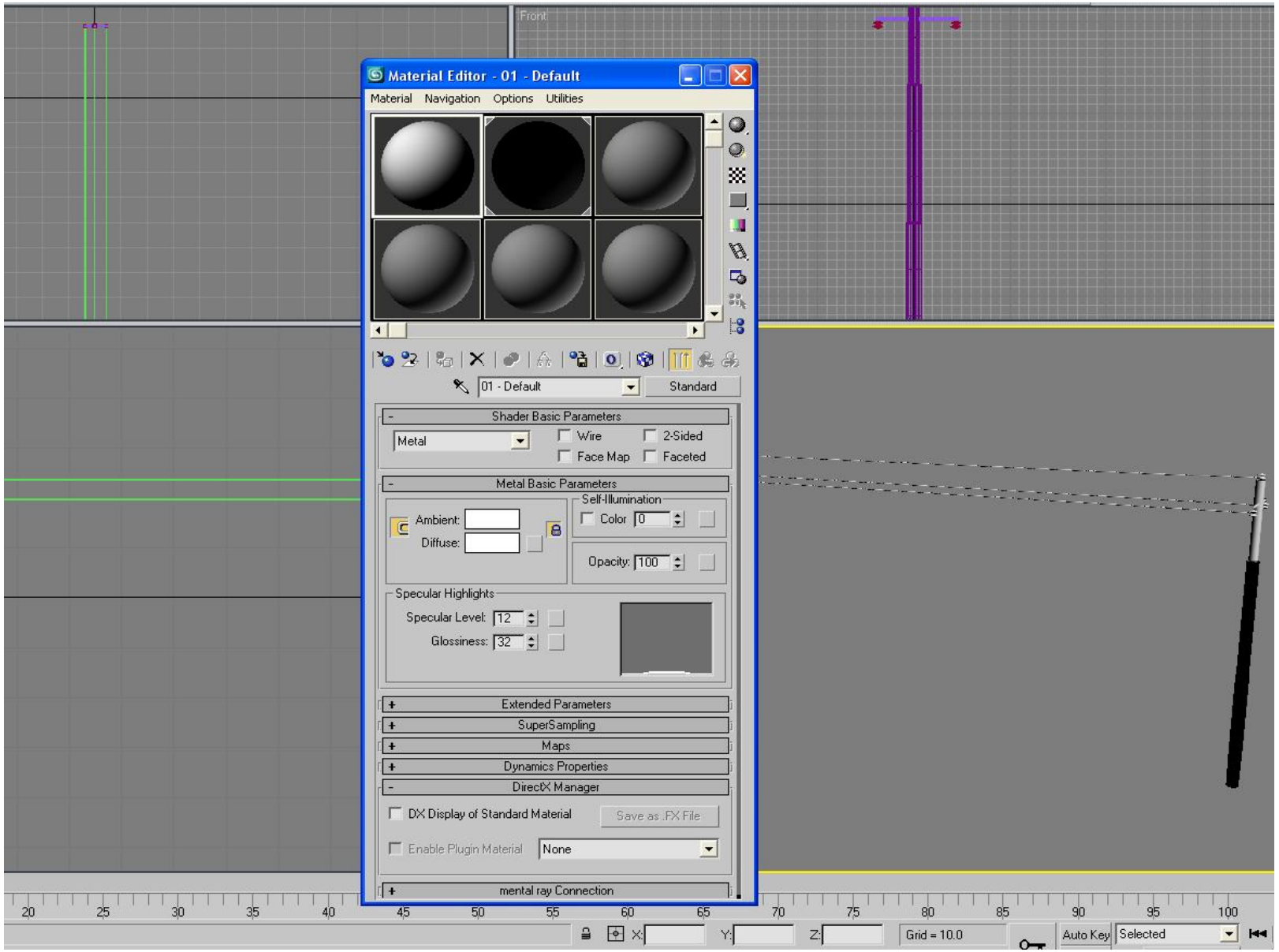
1) Taking Images of original instrument, measuring components and sketch design



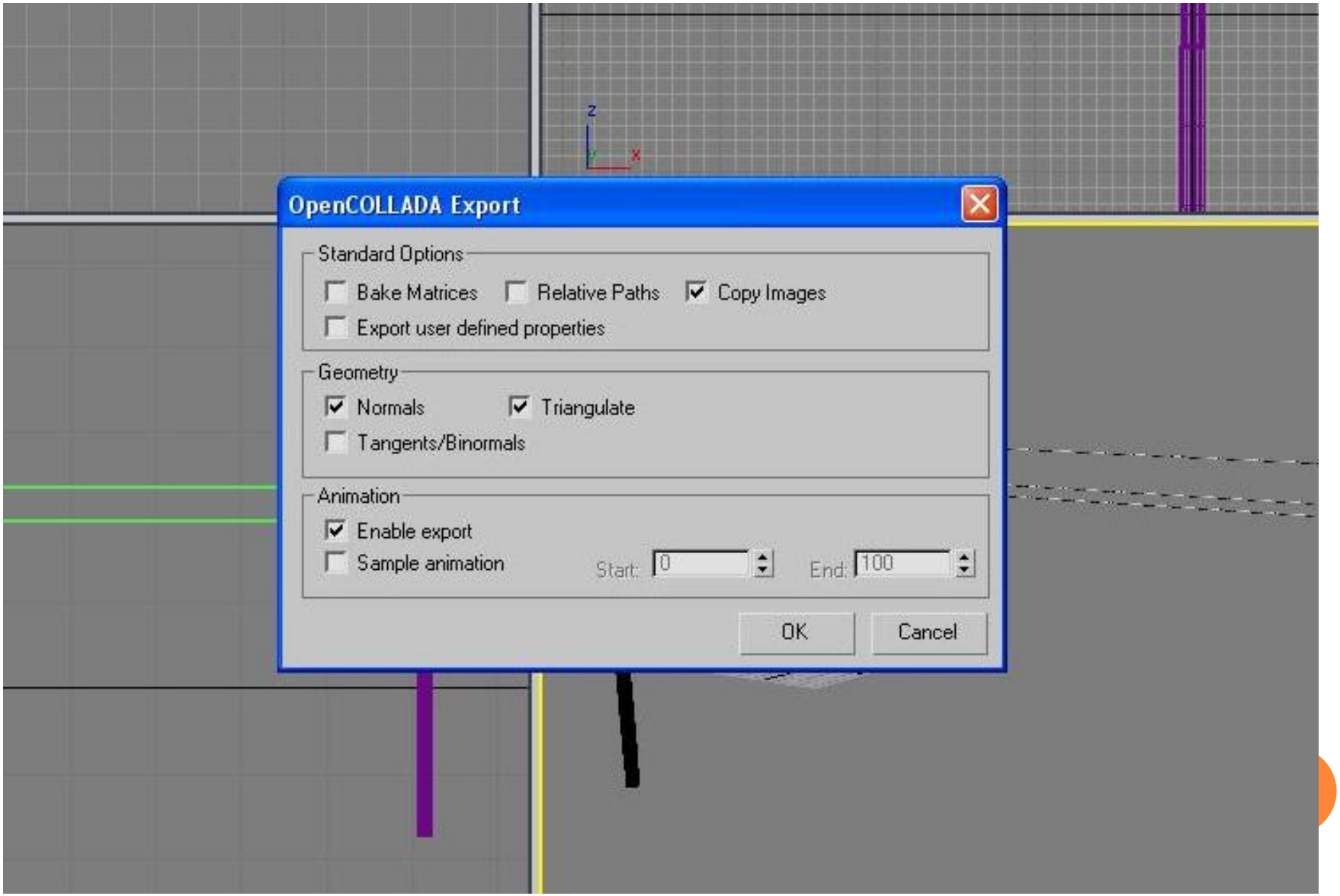
2) 3D Modeling of Objects in 3Ds Max software



3) Applying Texture in 3ds Max software

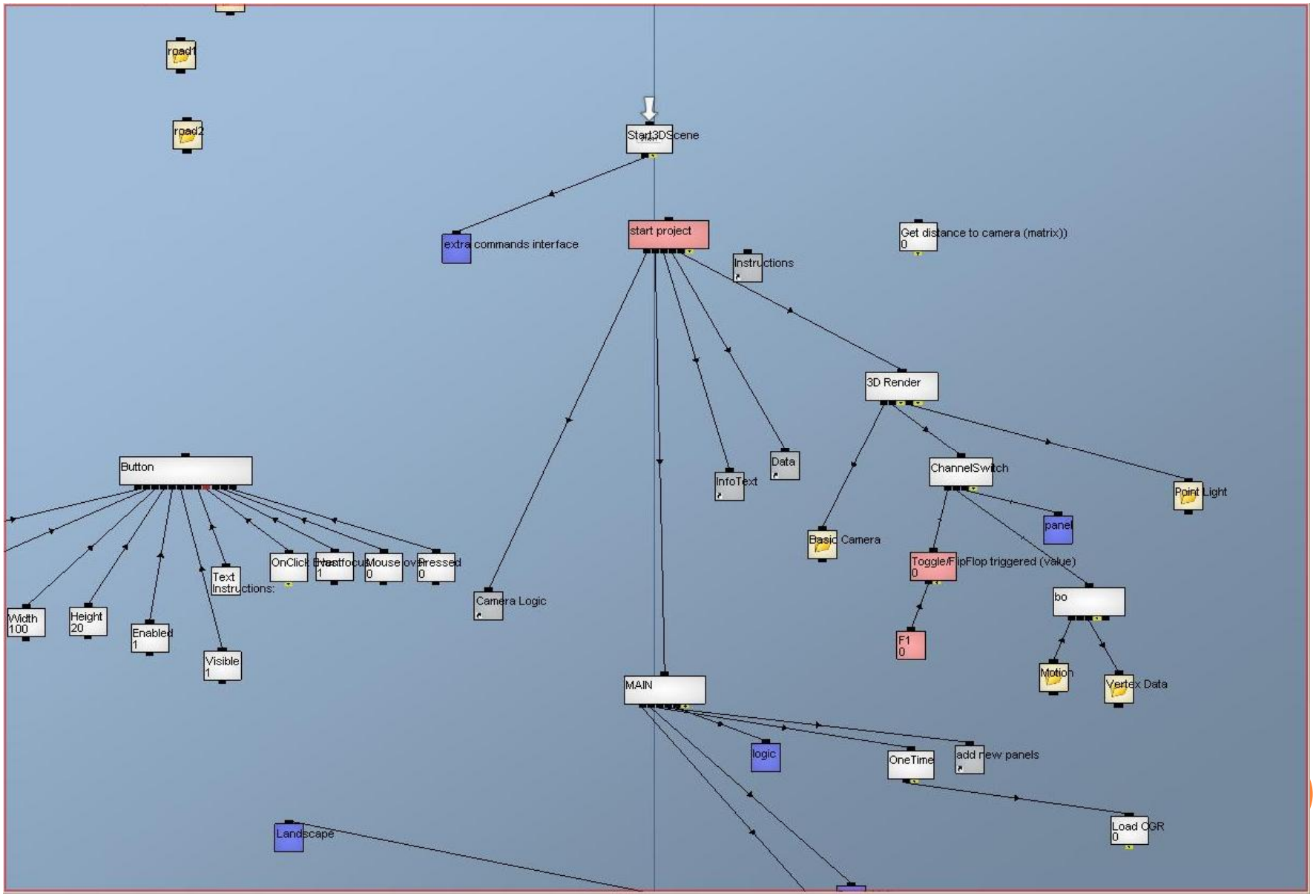


4) Exporting 3D designed objects to another software using Open Collada

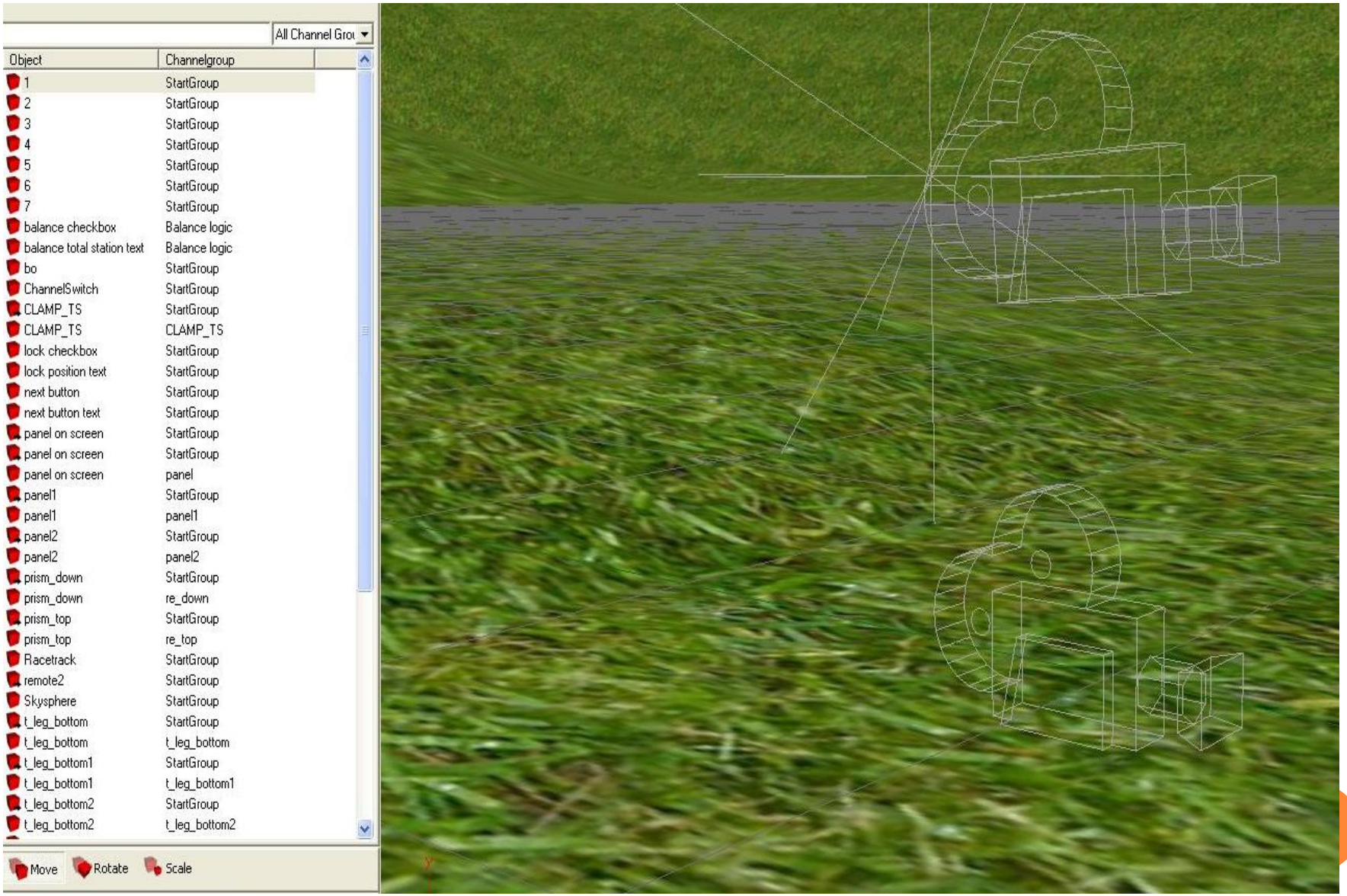


5) 3D Environment design in Quest 3D software

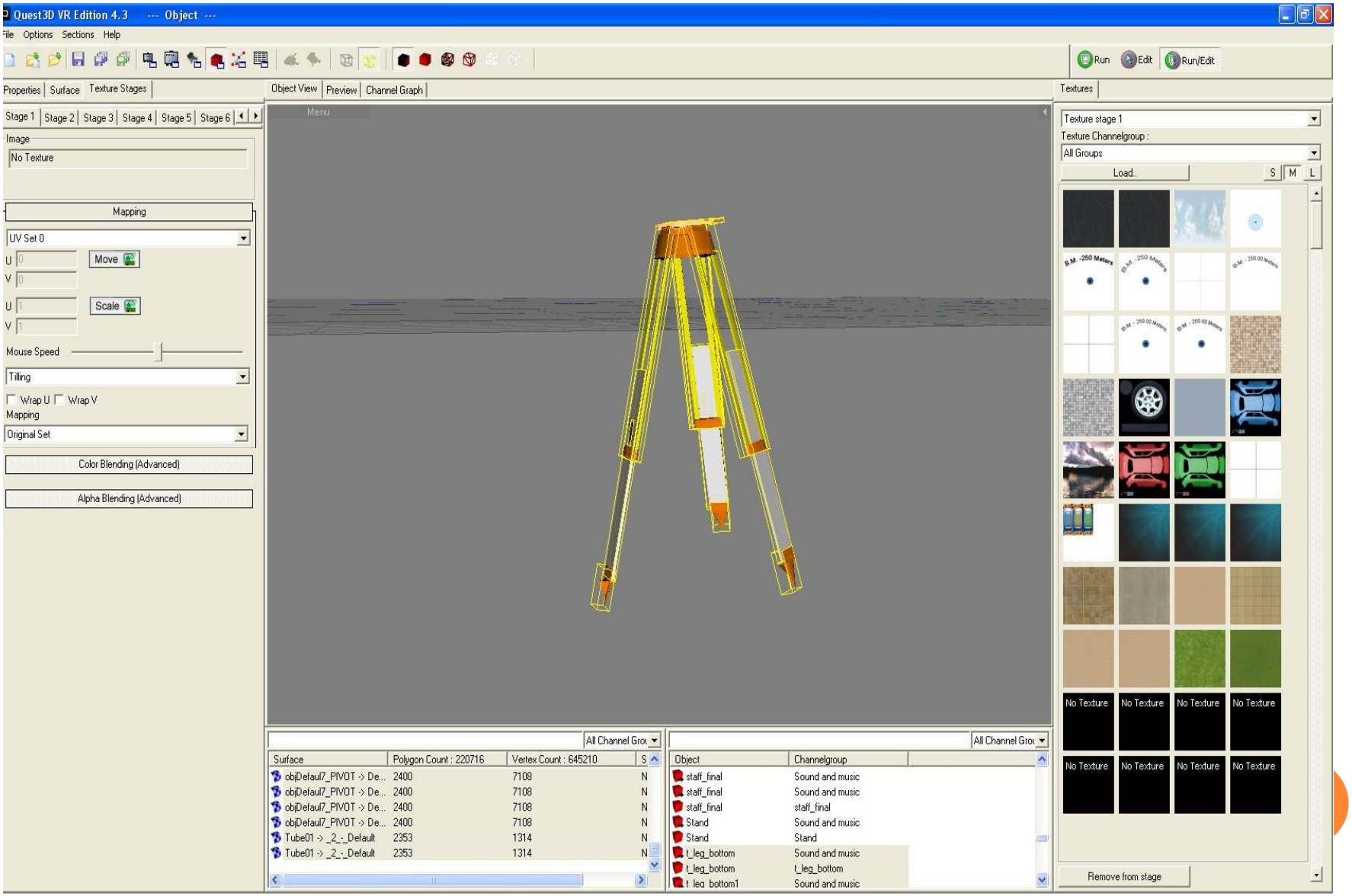
6) Applying animation and simulation to objects in Quest 3D Software



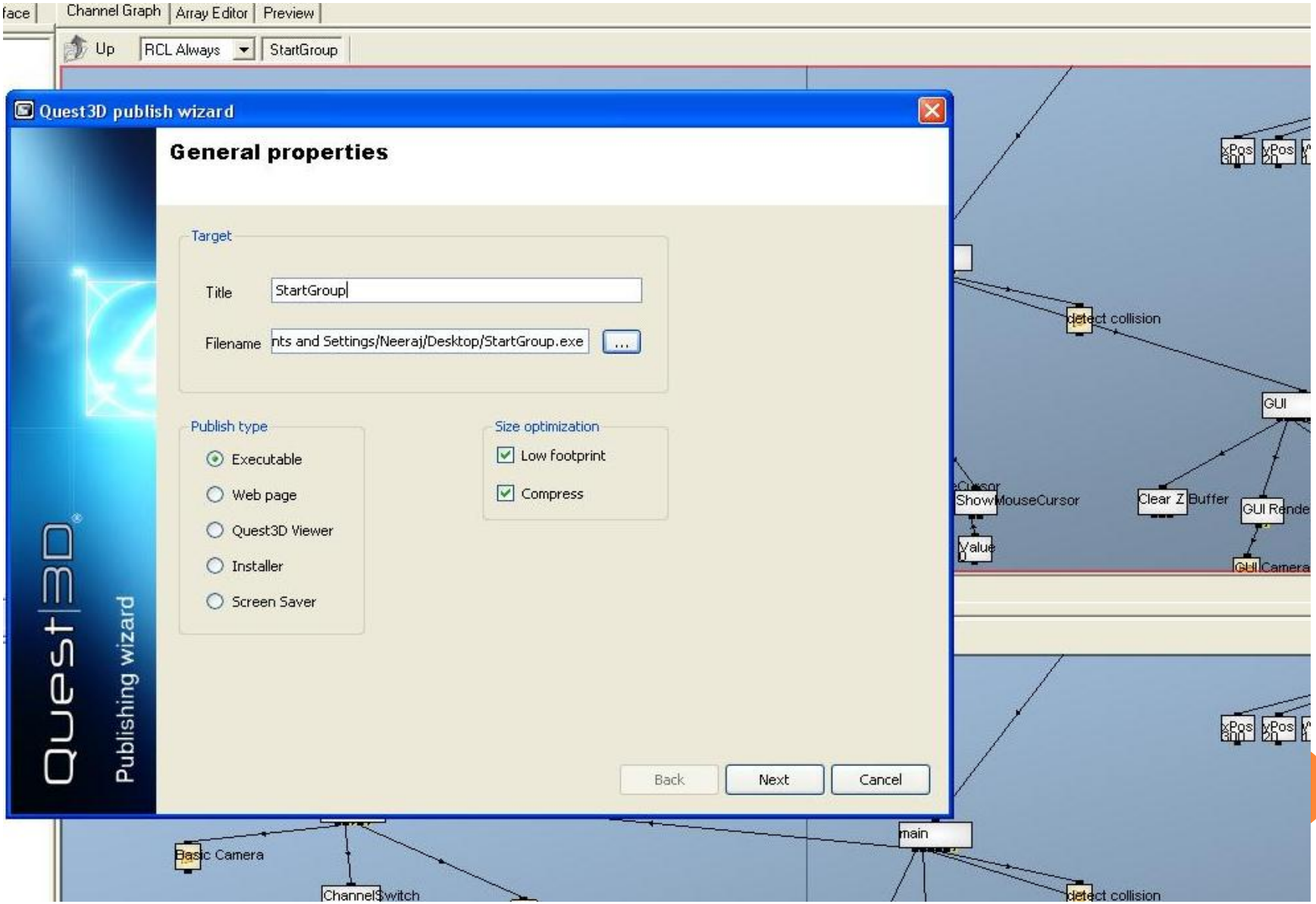
7) Positioning Cameras and Lighting in Quest 3D software



9) Rendering in Quest 3D software

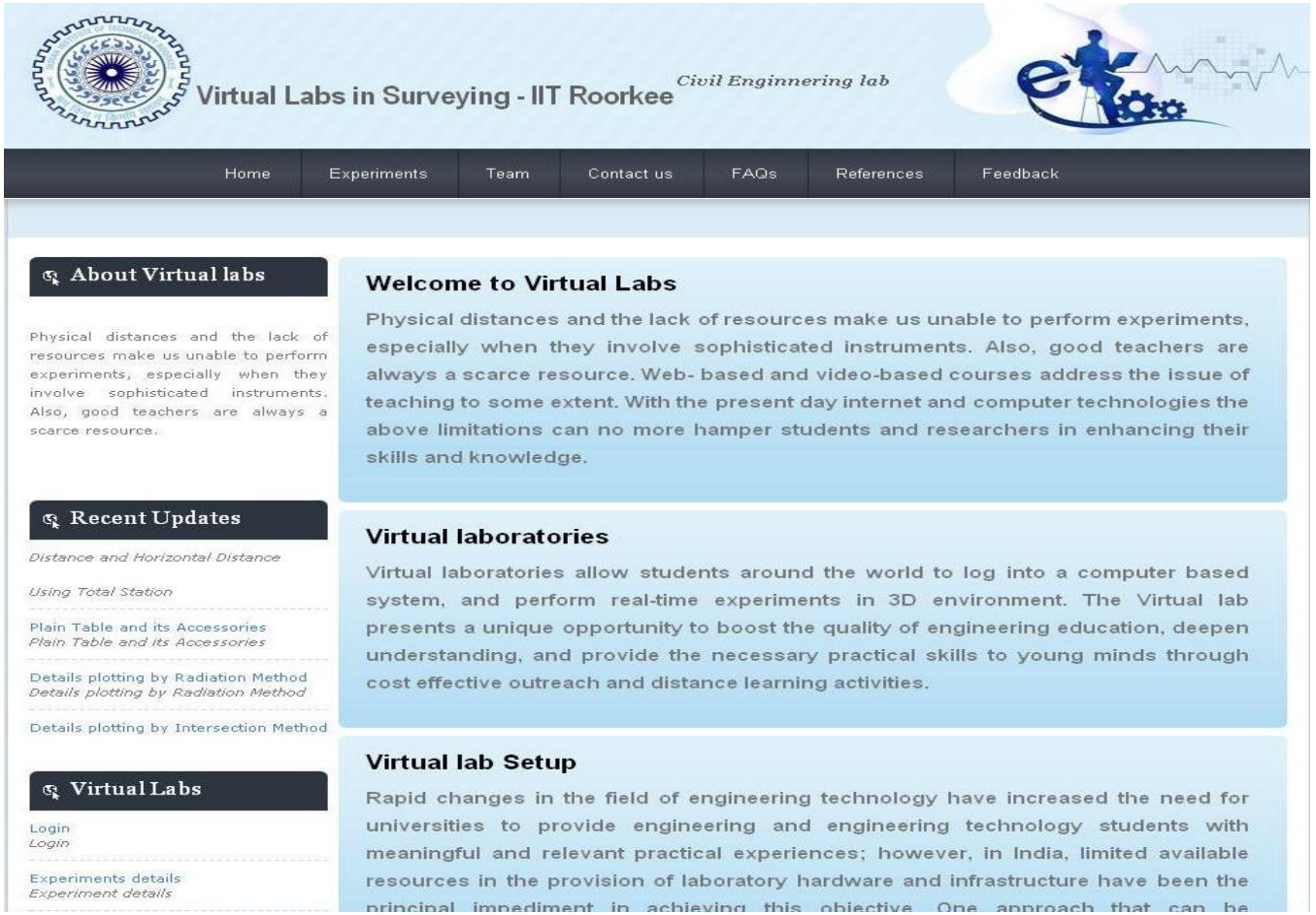


10) Generation of executable and web compatible file to use

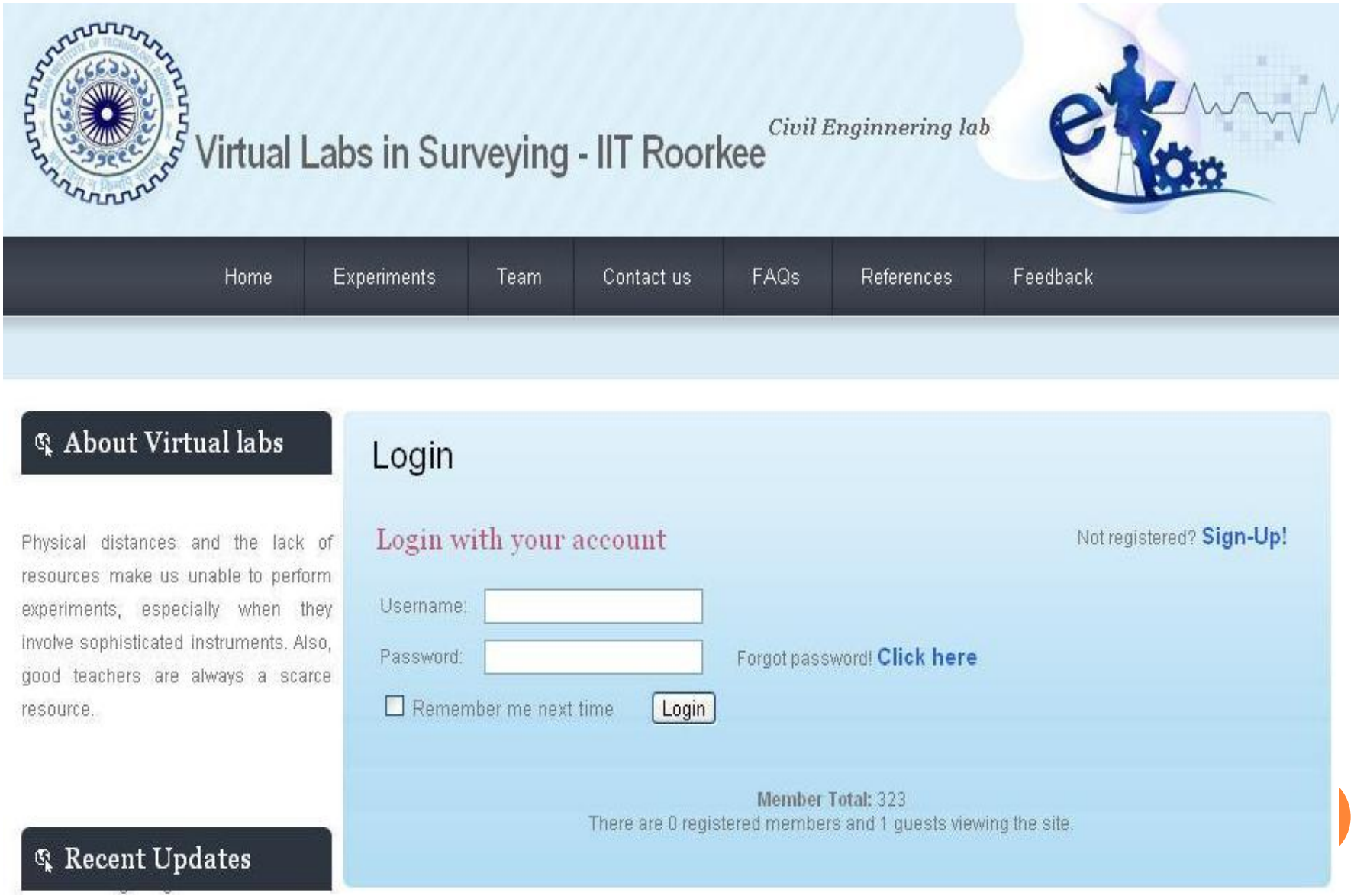


METHODOLOGY FOR WEBSITE DEVELOPMENT

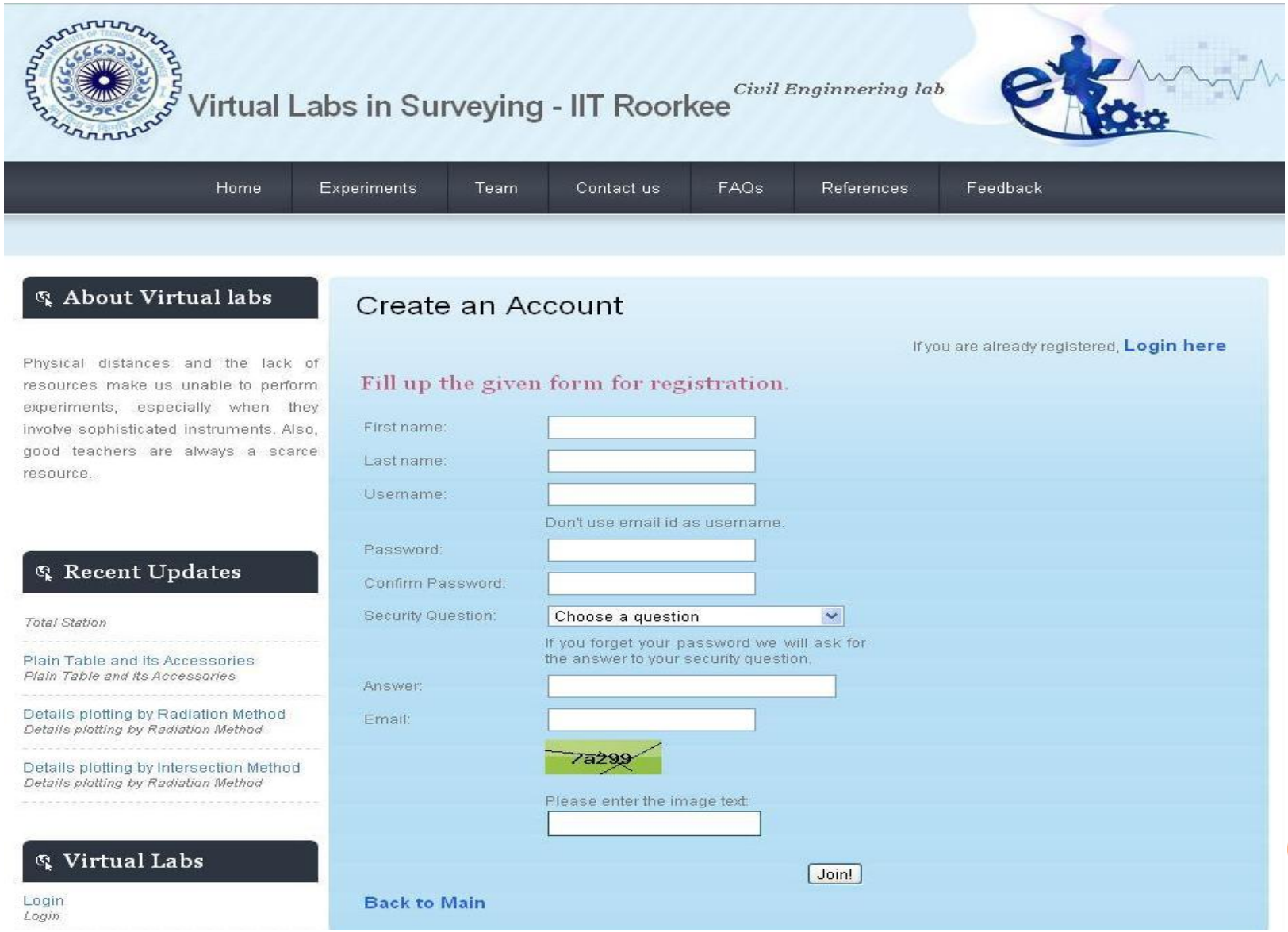
1) Design user interface



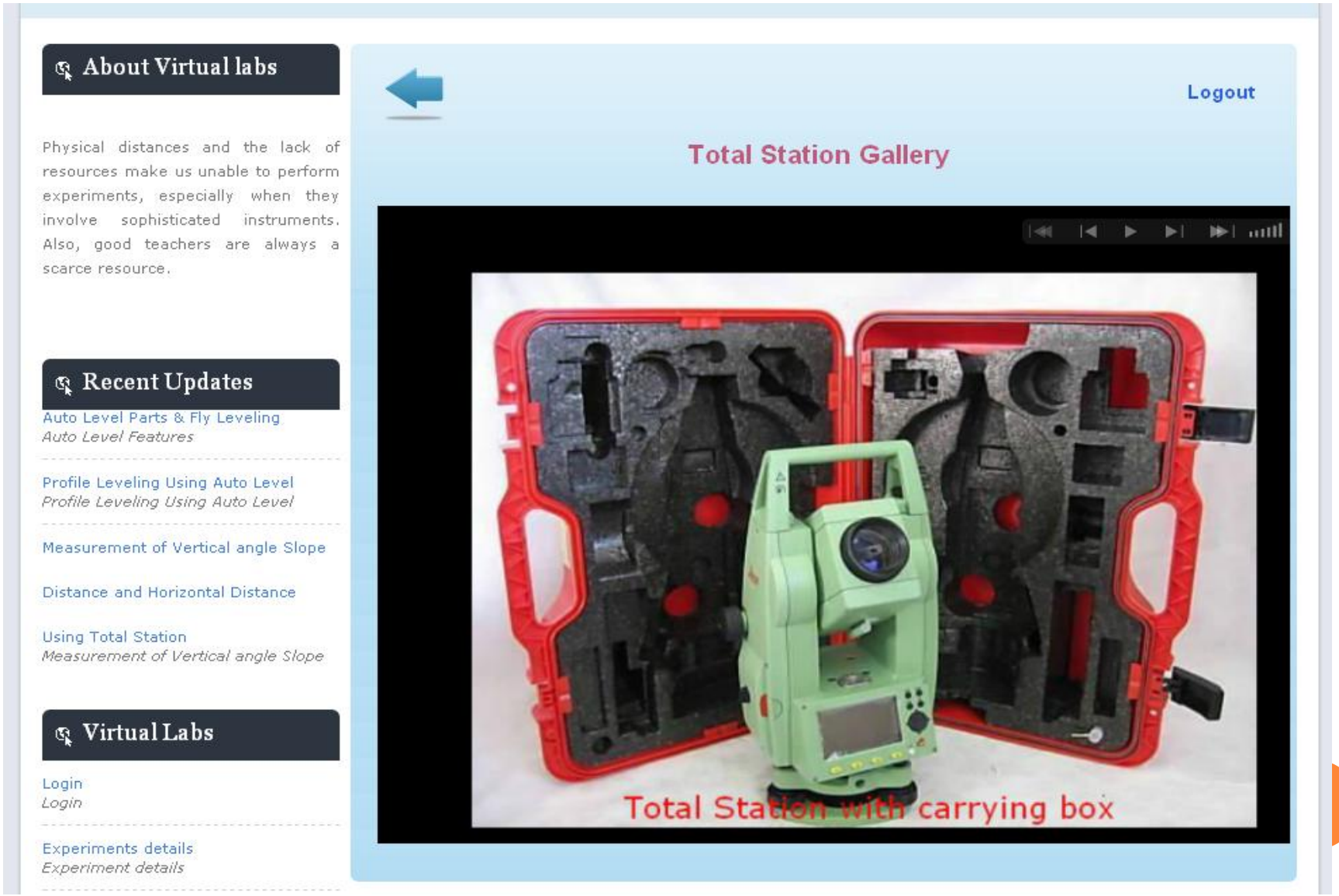
2) Create login form



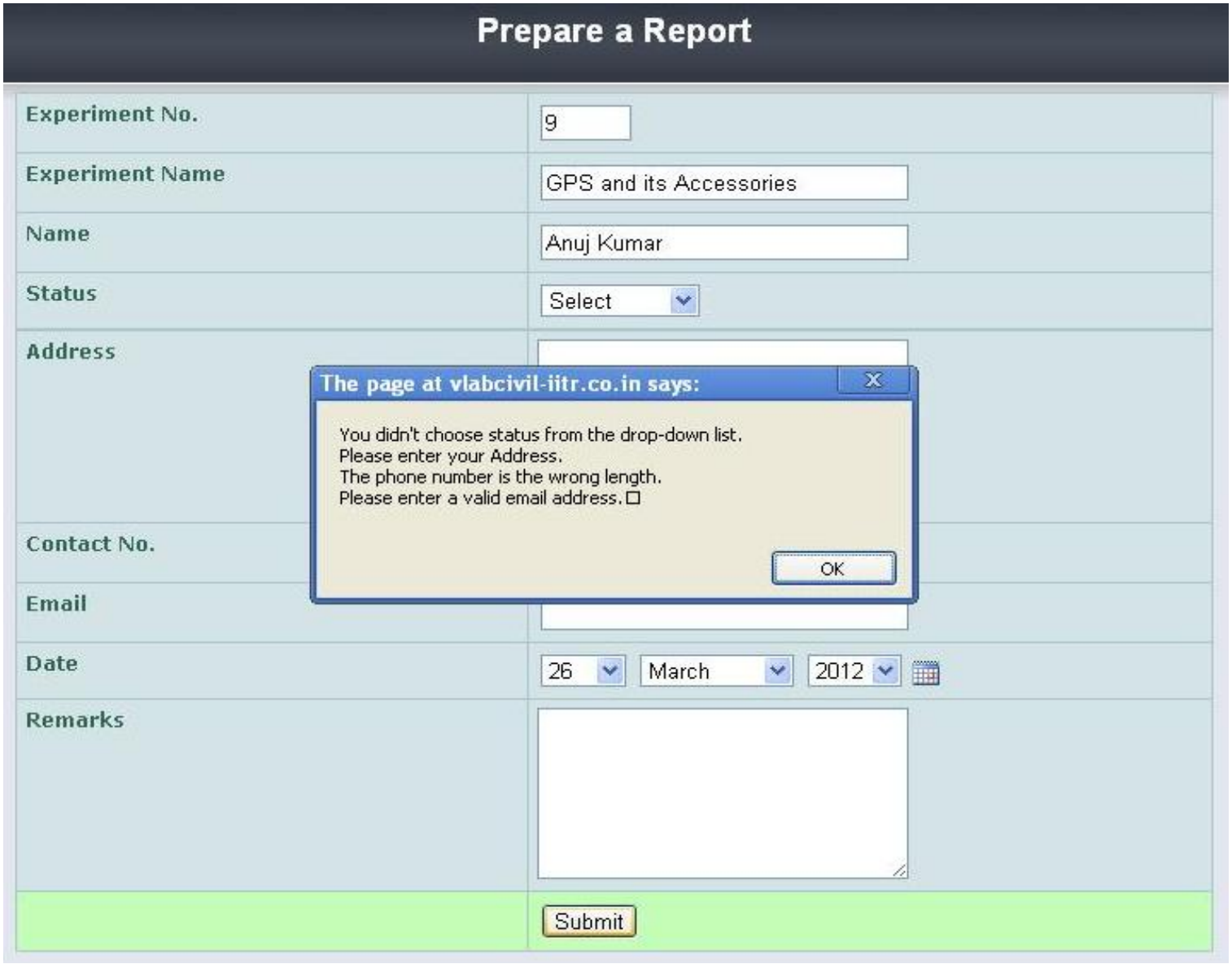
3) Create Registration form



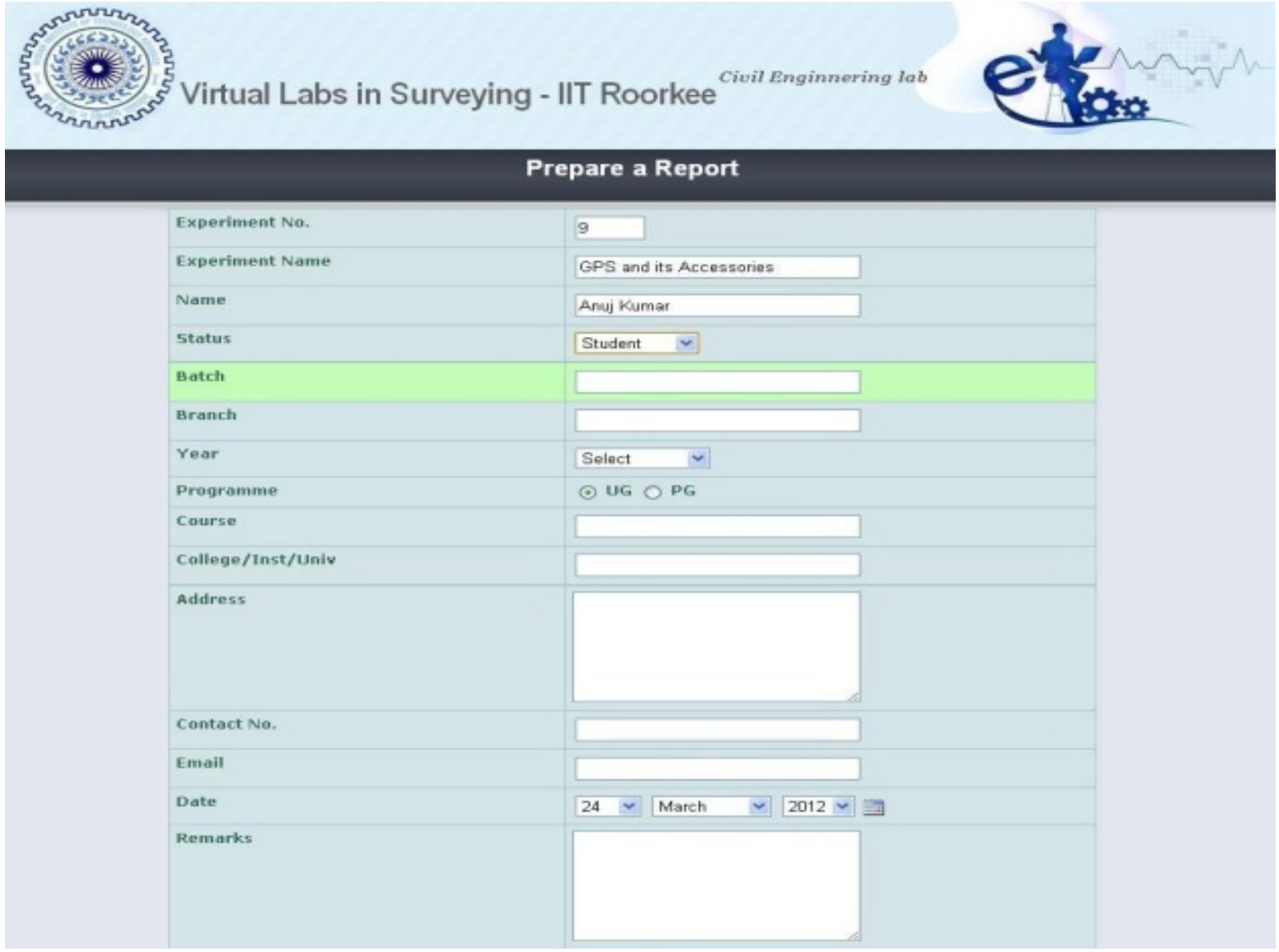
4) Embedding classroom video lecture and experiment video in the website



5) Validate pages and user using java script and PHP

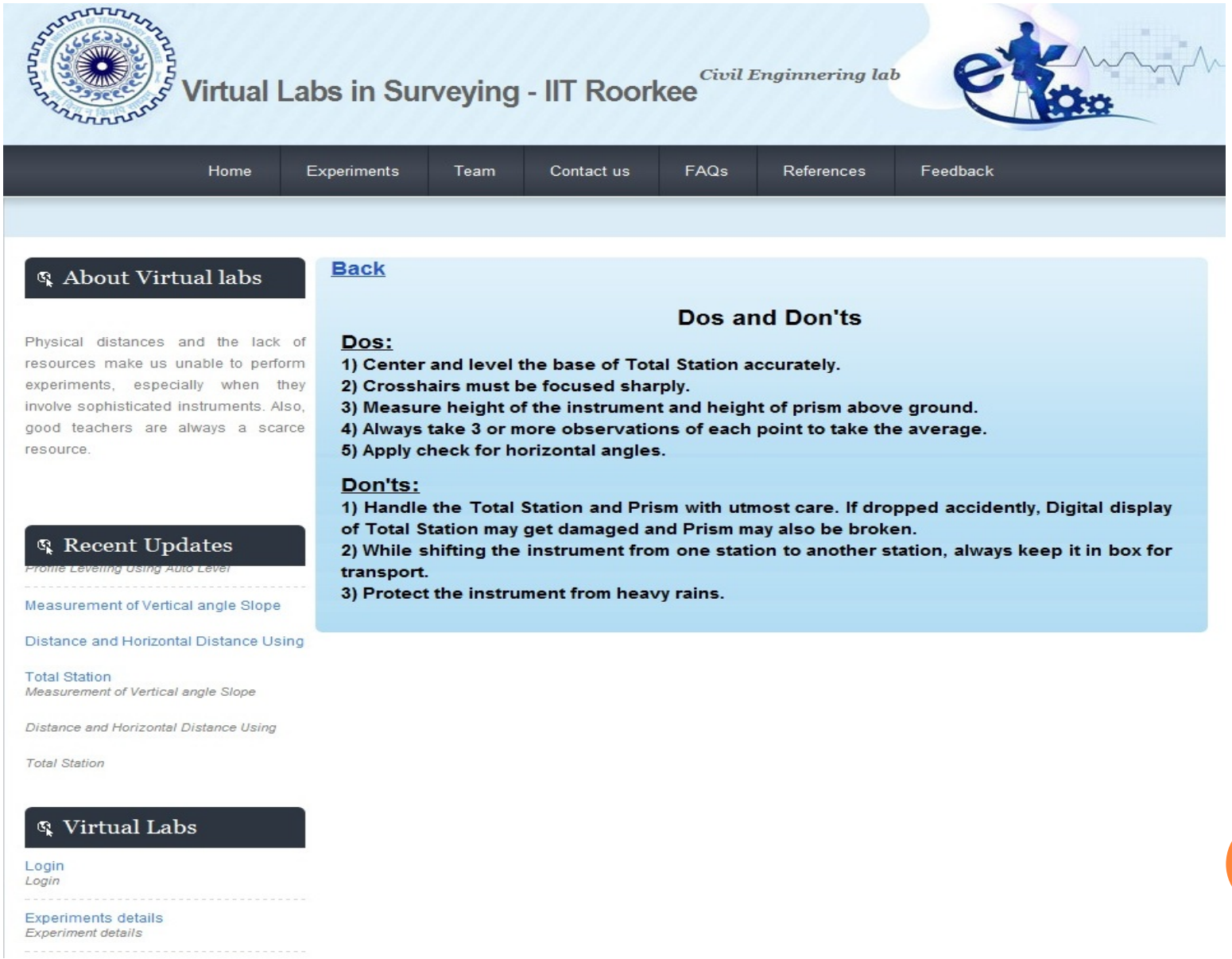


6) Report generation in PDF

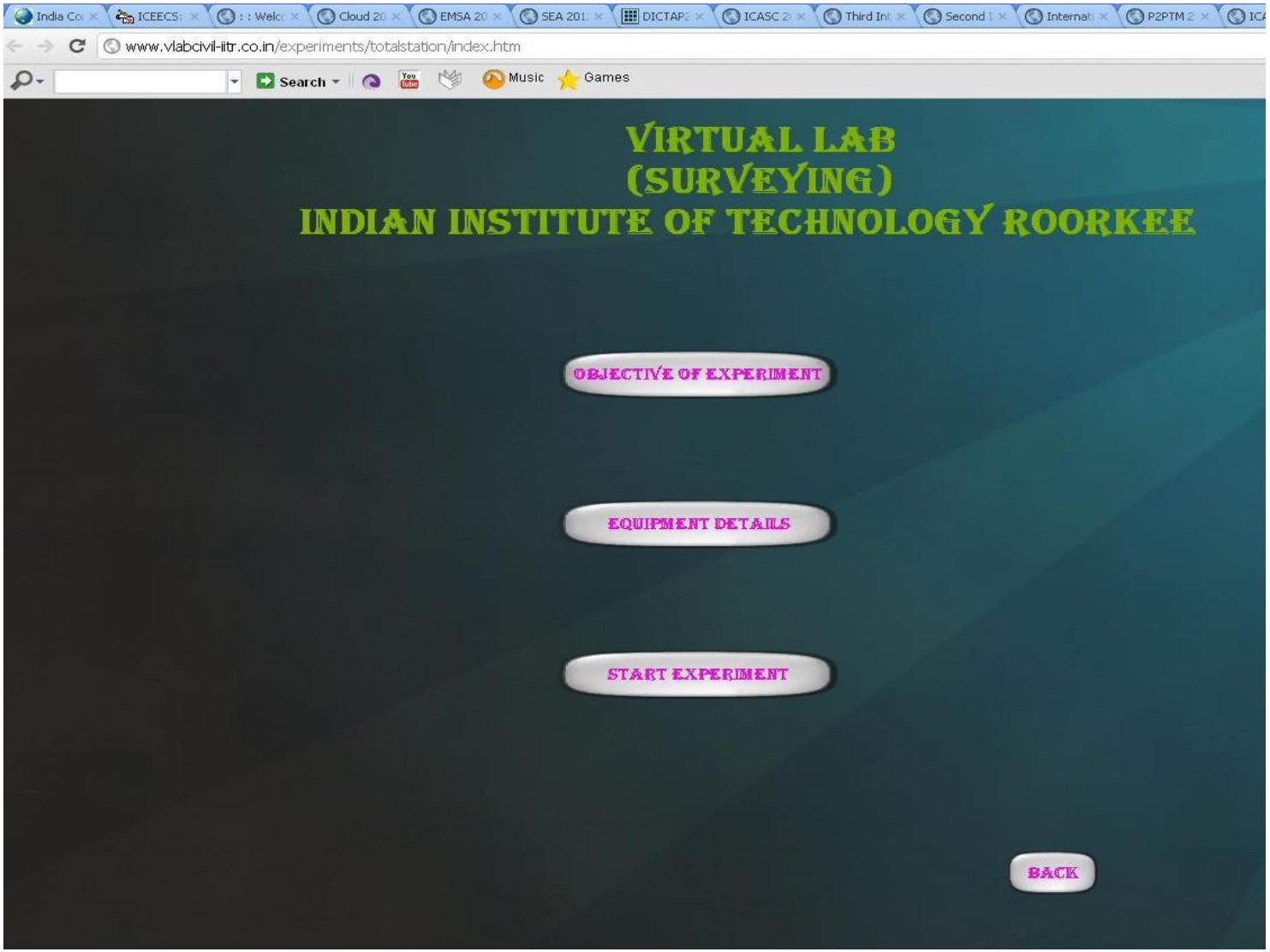


7) Photo gallery and slideshow using PHP and Flash

8) Do’s and Don’ts for Total station experiment



8) Finally, embedding 3D experiments in the website using PHP and Quest 3D Software



USING VIRTUAL LAB WEBSITE

Step 1: Go to the below URL in Web Browser:

http://www.vlabcivil-iitr.co.in
http://www.vlab.co.in

Step 2: To perform experiment online, first you have to register yourself on the website and get username and password.

Step 3: After registration you have to login with your username and password.

Step 4: Now you will see a list of experiments. Choose your experiment to perform online.

EXAMPLES

- Observations of Vertical and Horizontal angles and Distance using Total Station

- Observations using GPS

EXAMPLE 1: OBSERVATIONS OF VERTICAL AND HORIZONTAL ANGLES USING TOTAL STATION

Original Total station and 3D model of Total station

STEPS TO FOLLOW

•First logon to website using username or register yourself.
•Click on experiment list and select the total station experiment. Options available are as-

Instructions: *Screen will show the following links:*

1) Summary of Experiment

2) Objective

3) Equipment Used

4) Principle

5) Methodology

6) Manual for Total Station Working

STEPS TO FOLLOW

7) Working of Instrument

8) Download Executable File

9) Observations

10) Results

11) Total Station Gallery

12) Quiz

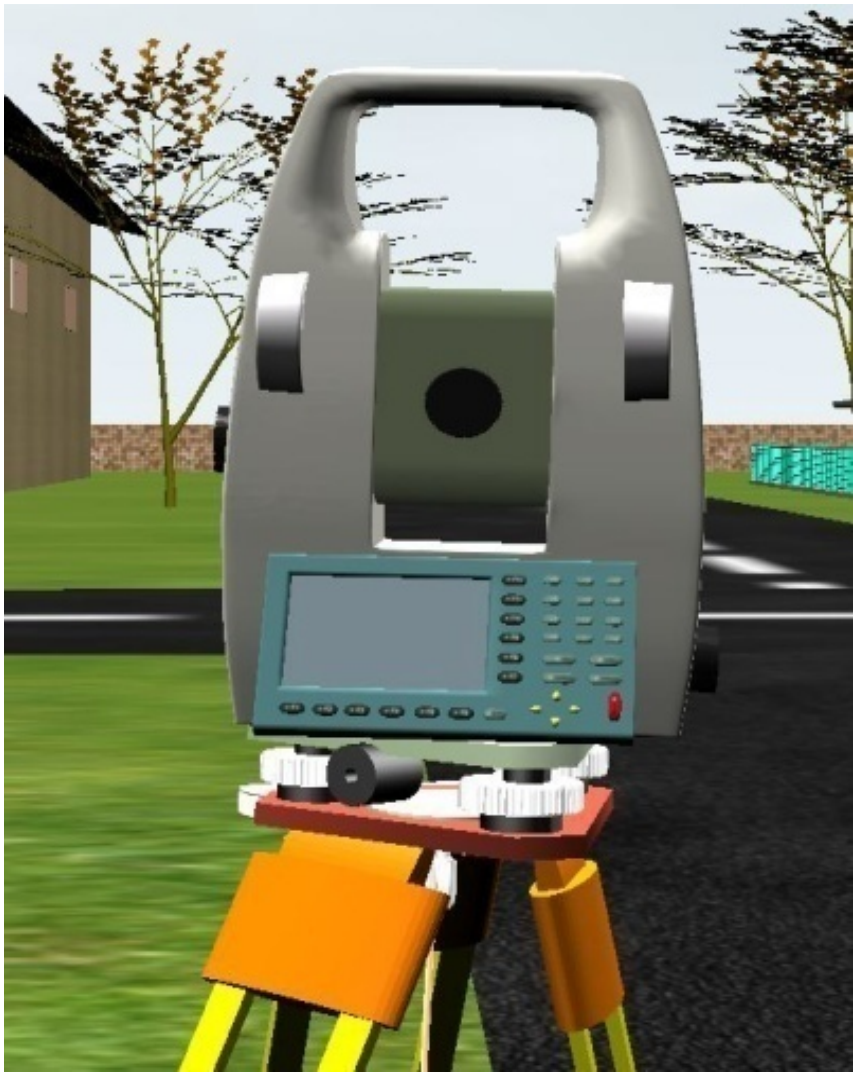
13) Dos and Don'ts

•Click on **“Methodology”** to see a video tutorial about performing experiment in real time environment in the field.

•Click on **“Manual for Total Station Working”** to see PDF documentation of the experiment manual in details. In this manual, all the information about the keys to be used to perform the experiment is given.

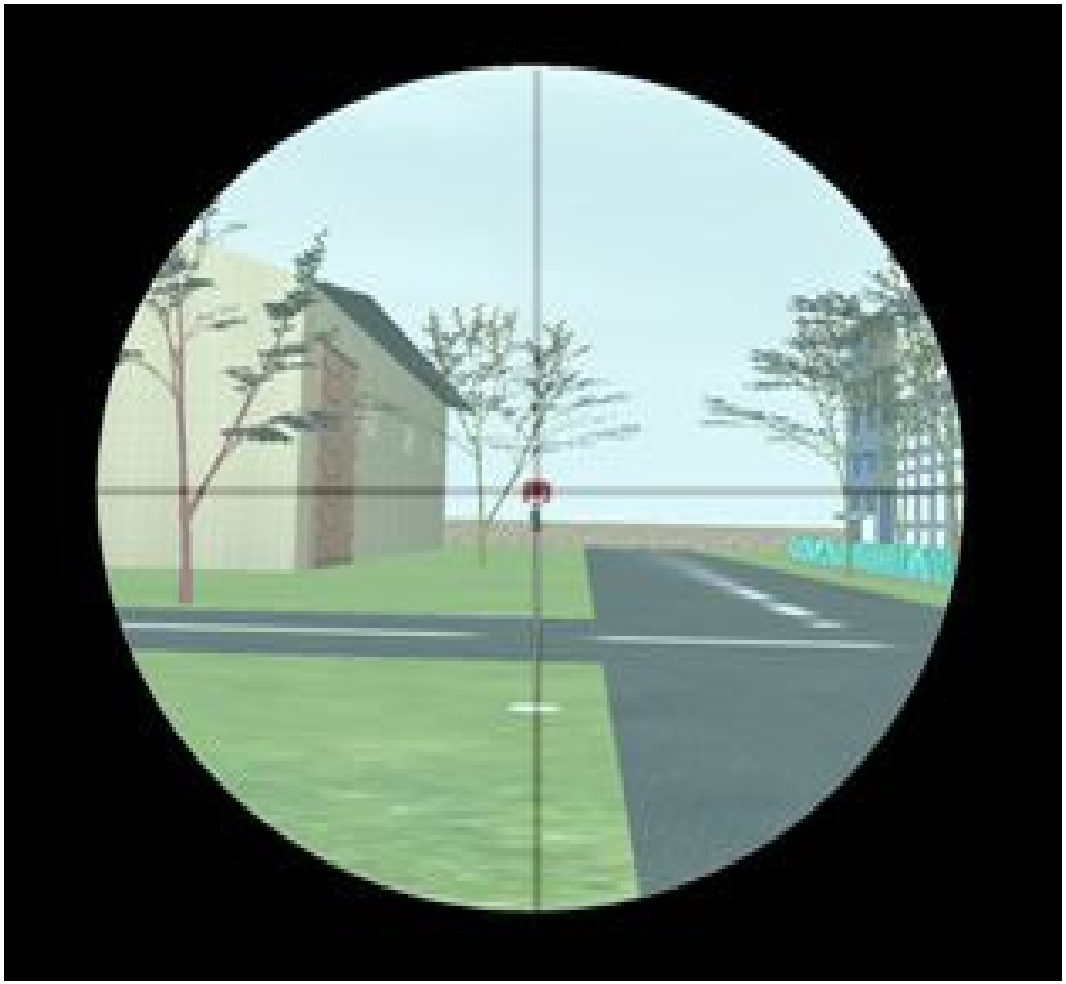
•Click on **“Working of Instrument”** to start the experiment in a virtual 3D environment. Brief steps are given below:

1. Set the Tripod over a known point. (Use keys: Ctrl + Up, Down, Left, Right (Arrow Keys))

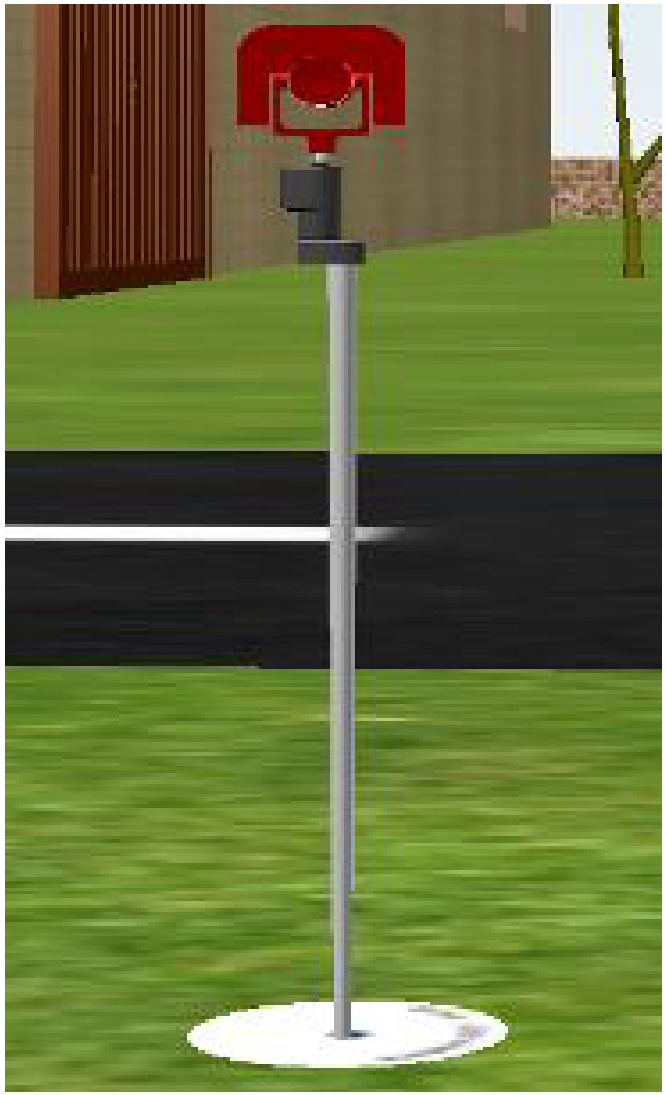


2. Fix the Total Station equipment over tripod. Level it and center it precisely over the ground point. (Use keys: Alt + Up, Down, Left, Right (Arrow Keys))

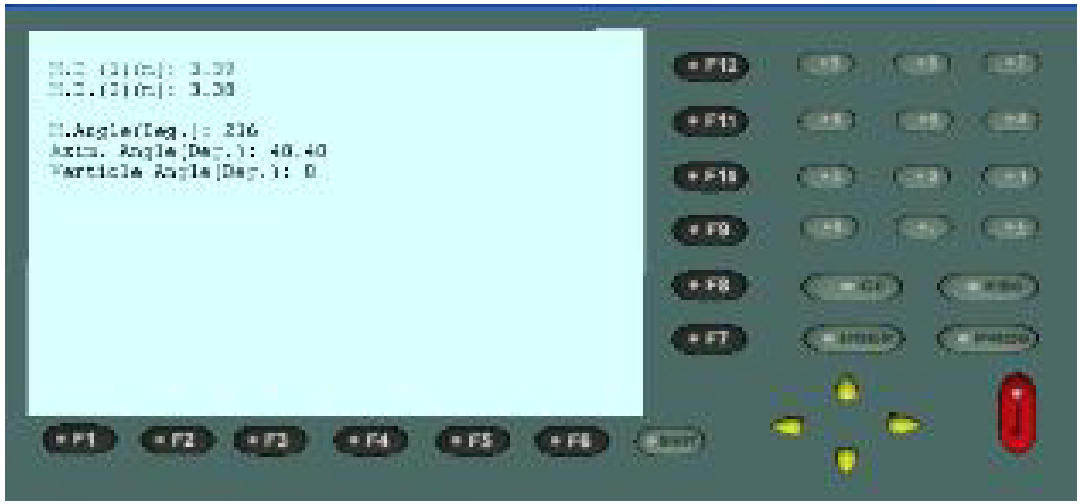
3. Focus cross hairs. (Use keys: 0, 8, 9)



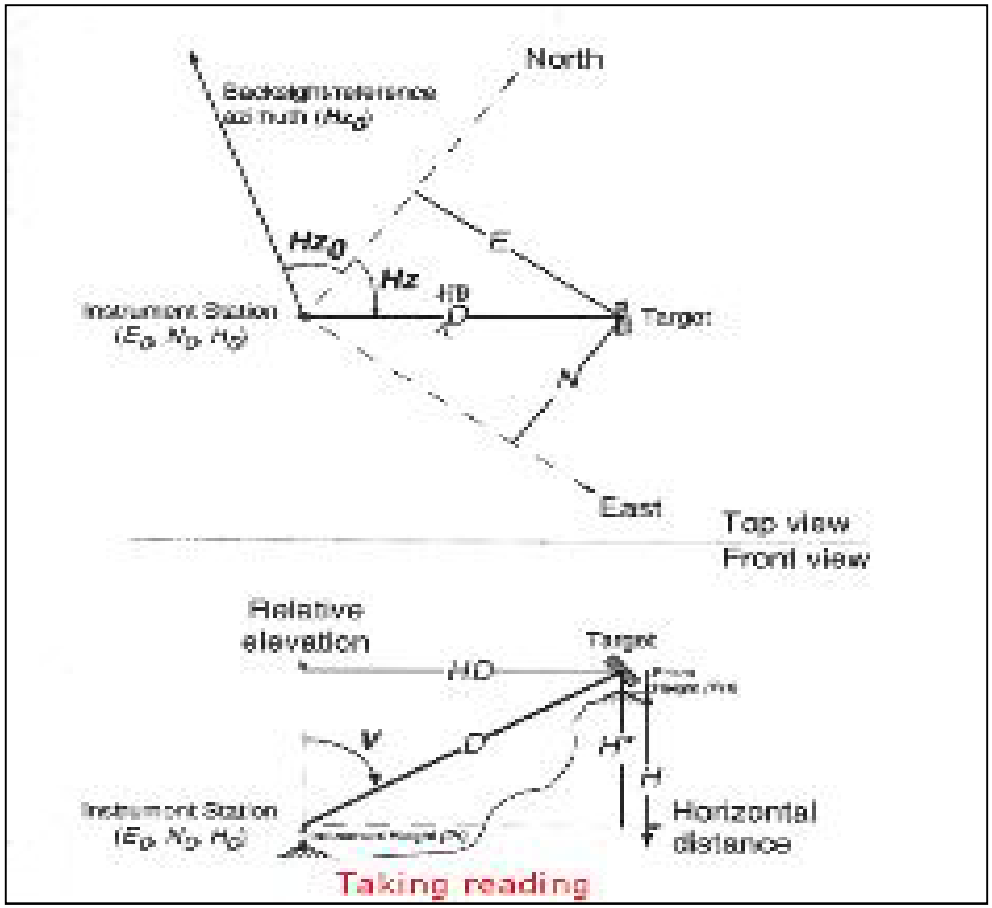
4. Keep the Prism Pole on a point whose observations are to be taken. Focus and bisect the center of the Prism.



5. Use the function buttons to measure horizontal and vertical angles. Store the data using function key of total station.



6. Focus and bisect the center of the Prism on another object and repeat step 5, for each location of the Prism to be bisected.



7. Download the data into a computer and use the total station software to compute horizontal angles and vertical angles.

8. Results can be saved and printed.

	Angle					
Station	°	'	"	Target/Comment		V or H
A	000	00	00	Zenith		
	71	33	00	Top of building	α1	V
	110	15	00	Ground level of building	α2	V
	59	50	00	Peg B	A	H
B	000	00	00	Peg A		
	62	30	00	Top of building	B	H
				Lineal between pegs	10.250 m	

V = vertical angle, H = horizontal angle

Quiz

Recent Updates

Auto Level Parts & Fly Leveling
Auto Level Features

Profile Leveling Using Auto Level
Profile Leveling Using Auto Level

Measurement of Vertical angle Slope

Distance and Horizontal Distance Using

Total Station

Plain Table and its Accessories
Plain Table and its Accessories

Details plotting by Radiation Method
Details plotting by Radiation Method

Details plotting by Intersection Method
Details plotting by Radiation Method

Virtual Labs

Login
Login

Experiments details
Experiment details

Related Links
Related Links

Q2. A theodolite may be used for

(a) ◯ laying off horizontal angles (b) ◯ Locating points on lines
(c) ◯ Determining difference in elevation (d) ◯ Setting out curves
(e) ◯ Any of the curve

Q3. In a theodolite the line passing through the intersection of the horizontal and vertical cross hairs and the optical centre of the object glass and its continuation, is known as

(a) ◯ Horizontal axis (b) ◯ Vertical axis
(c) ◯ Line of collimation (d) ◯ Line of sight
(e) ◯ Either of (C) or (D) above

Q4. A geodimeter is used for the measurement of

(a) ◯ Distances (b) ◯ Angles
(c) ◯ Areas (d) ◯ Volume
(e) ◯ Bearing of a point

Q5. A geodimeter is based on the principle of

(a) ◯ Optic (b) ◯ Reflection of light waves
(c) ◯ Propagation of modulated light waves (d) ◯ X-rays
(e) ◯ Radio-waves

Q6. A tellurometer works on the principle of

(a) ◯ Optics (b) ◯ Reflection of light waves
(c) ◯ High frequency radio waves (d) ◯ Propagation of modulated light waves
(e) ◯ X-rays

Q7. In case of theodolite, centring is the process of

(a) ◯ turning telescope in vertical direction (b) ◯ setting the theodolite exactly over the station mark
(c) ◯ Rotating the telescope in clockwise direction in the horizontal plane (d) ◯ rotating the telescope the telescope in anti-clockwise direction about the vertical axis
(e) ◯ None of the above

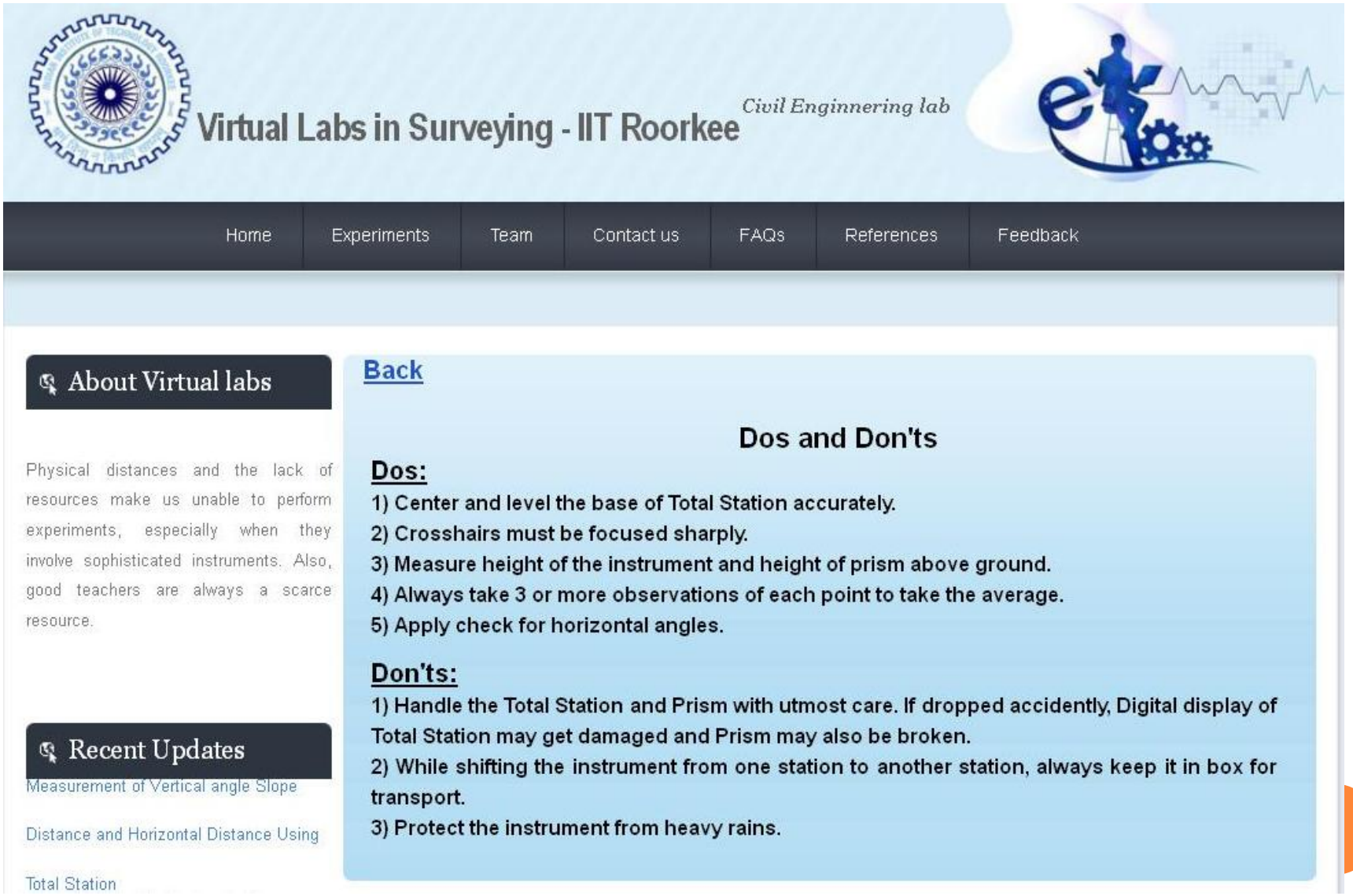
Q8. A theodolite may be used for

(a) ◯ Laying off horizontal angles (b) ◯ Locating points on line
(c) ◯ Determining difference in elevation (d) ◯ Setting out curves

Q9. In a theodolite the line passing through the intersection of the horizontal and vertical cross hairs and the optical centre of the object glass and its continuation, is known as

(a) ◯ Horizontal axis (b) ◯ Vertical axis
(c) ◯ Line of collimation (d) ◯ Line of sight

Dos and Don’ts in the experiment




Performing experiment with Total Staion

Example 2: OBSERVATIONS USING GPS

Original GPS and 3D model of GPS

STEPS TO FOLLOW

•First logon to website using username or register yourself.
•Click on experiment list and select the GPS experiment. Options available are as-

Instructions: Screen will show the following links:

1. Summary of Experiment

2. Objective

3. Equipment Used

4. Principle

5. Methodology

6. Working of Instrument (Compatible with Win XP SP2)

STEPS TO FOLLOW

7. Download Executable File

8. Observations

9. Additional Details

10. Quiz

11. Do’s and Don'ts

•Click on **“Methodology”** to see a video tutorial about performing experiment in real time environment in the field.

•Click on **“Manual for Total Station Working”** to see PDF documentation of the experiment manual in details. In this manual, all the information about the keys to be used to perform the experiment is given.

•Click on **“Working of Instrument”** to start the experiment in a virtual 3D environment. Brief steps are given below:

1. **Press P button on keyboard to show/hide GPS**

2. Click on Power Button to turn GPS receiver ON/OFF

3. Click on Enter Button to confirm

4. GPS detects satellite and confirm operation for navigation.

5. Click on IN Button to know the current latitude and longitude.

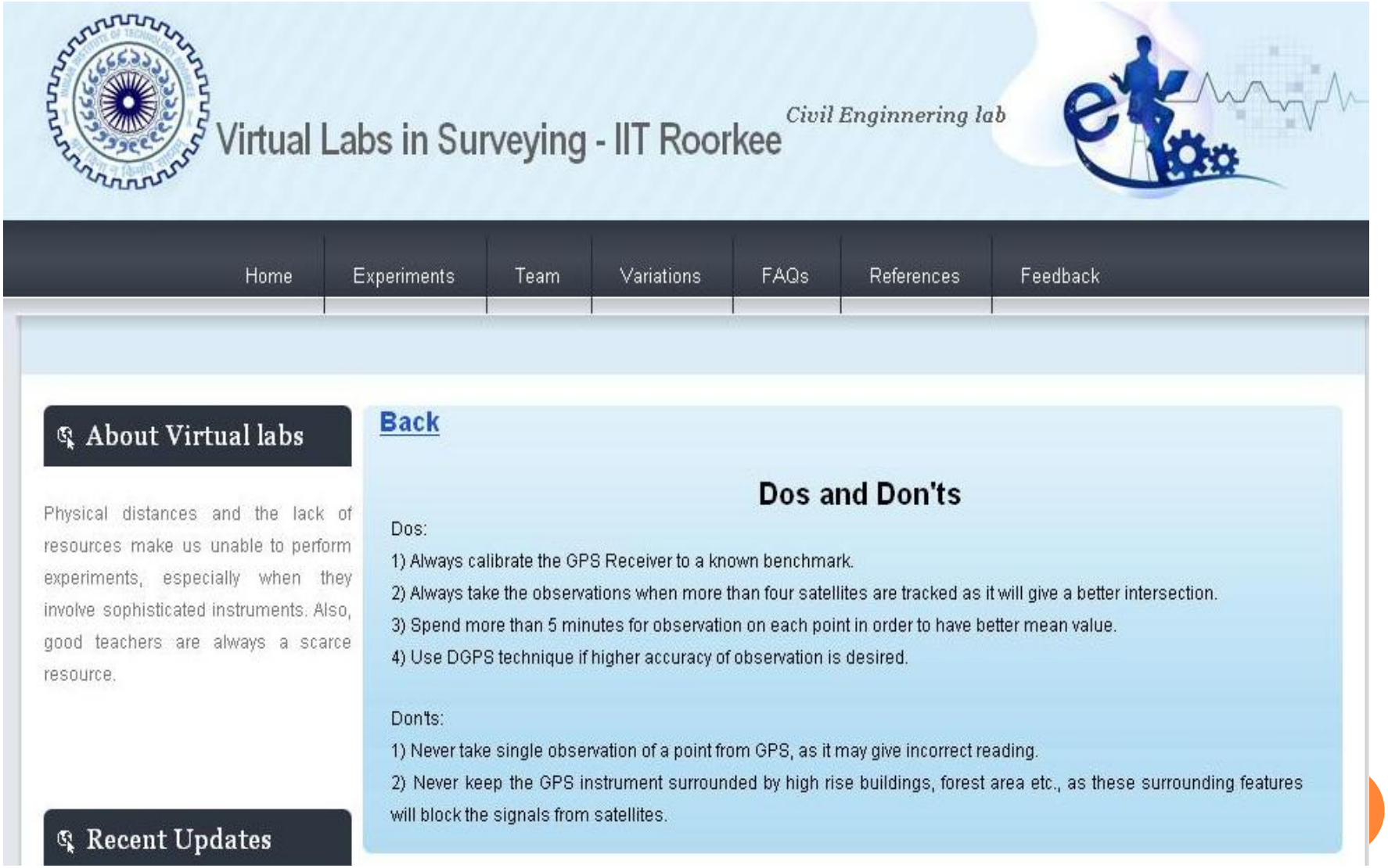
6. Press ESC Button to stop operation at any time or enter values in the ID text box to store different values and click on GOTO Button.

7. If GOTO Button is pressed then readings are saved.

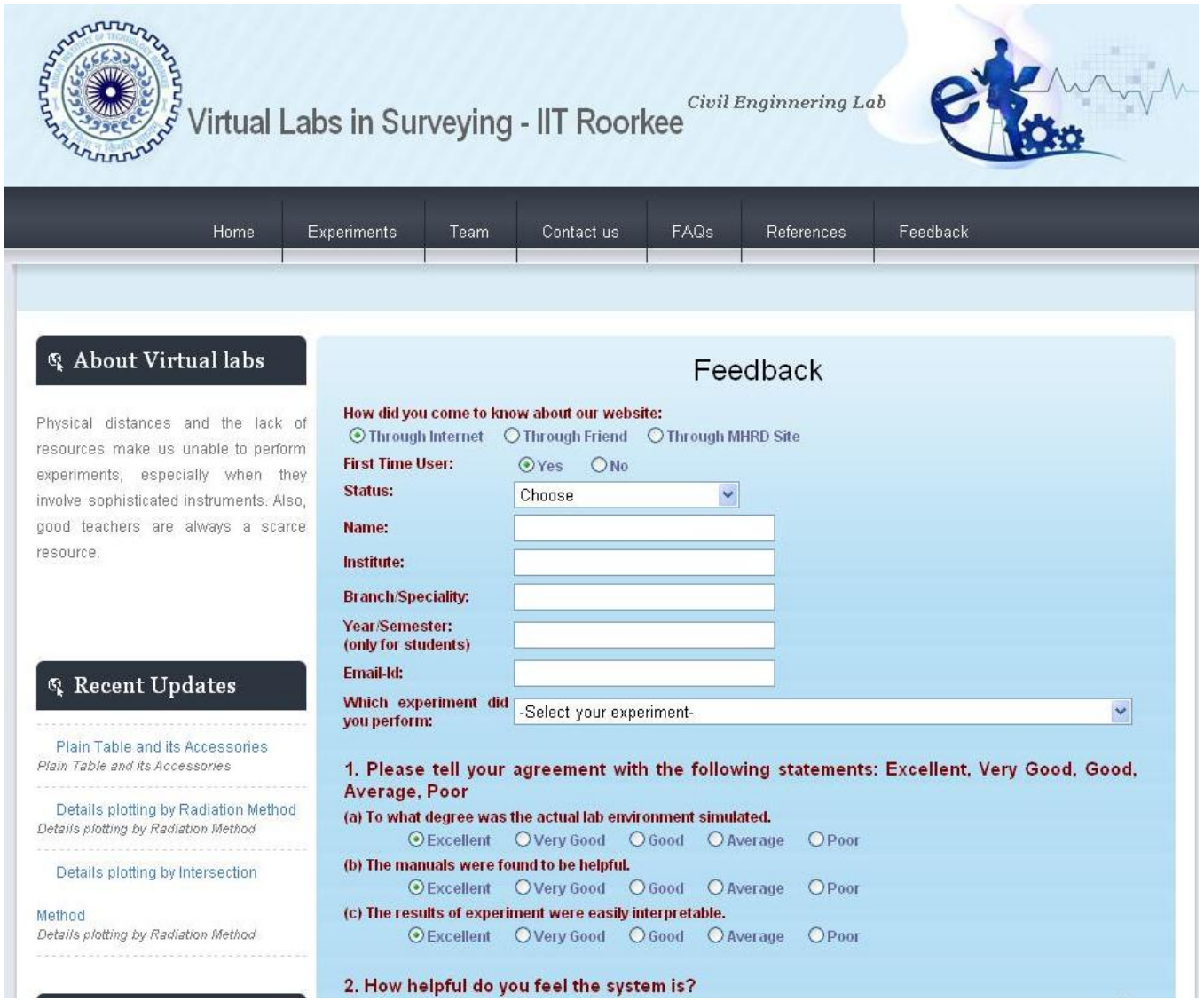
8. Press OUT Button to generate text files having all readings.

9. Press ‘Q’ Button on keyboard to stop the data collection.

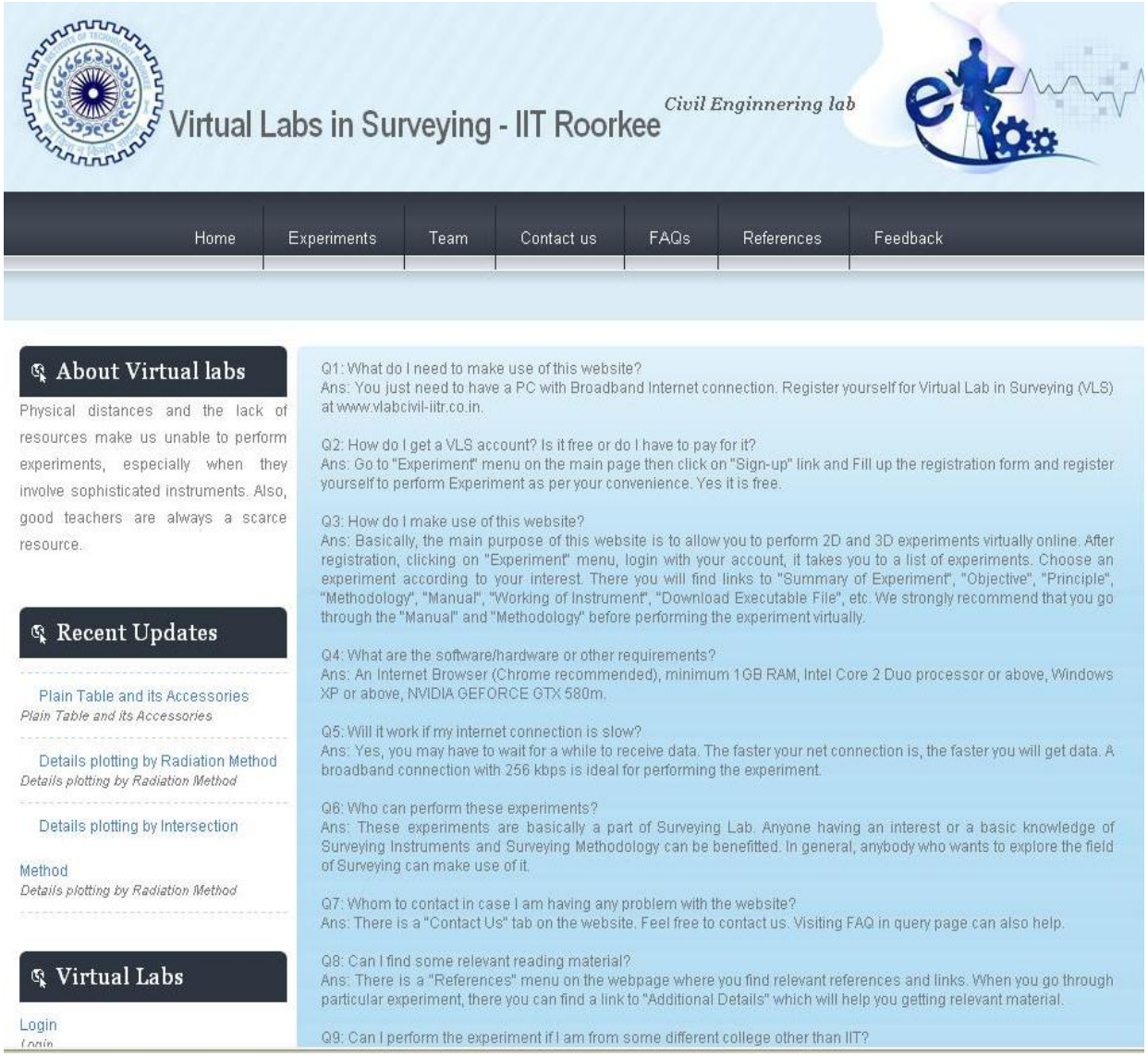
Dos and Don’ts in GPS experiment



Feedback form for the user



FAQ to check student knowledge



References for extra knowledge on the experiment can be find at the links mention below

1) Arora, K.R. (2005). Surveying, volume 2. Standard Book House. 675 p.
2) Chandra, A.M. (2002). Plane Surveying. New Age International (P) Limited. 652 p.
3) Davis, Raymond E. and Foote, Francis S. (1953). Surveying: Theory and Practice. 4th Ed.McGraw-Hill Book Company. 1021 p.
4) Duggal, S.K. (2004). Surveying, volume 1. Tata McGraw-Hill Publishing Company Limited.630 p.
5) Charles D. and Wolf, Paul R. (2008). Elementary Surveying: An Introduction to Geomatics.Pearson Prentice Hall. 931 p.
6) Moffitt, Francis H. and Bouchard, Harry (1990). Surveying. 8th Ed. Harper & Row Publishers.876 p.

Online Resources

http://www.bilawchuk.com/mark/index.html
http://science.howstuffworks.com/virtual-military.htm
http://accad.osu.edu/~mlewis/VRML/Class/syl.html
http://www.x3dom.orghttp://virtualenvironments.pbworks.com/f/monahan.pdfhttp://www.isprs.org/proceedings/XXXV/congress/comm6/papers/697.pdf
http://www.ccis2k.org/iajit/PDF/vol.8,no.1/6.pdfhttp://diglib.eg.org/EG/DL/Conf/EG2004/short/short48.pdf