ST5 3D STUDY PROGRAM
Update: 11/6/11

- Test Matrix
- 3D Subjective Studies

The ST5 3D Study Program consists of two main areas. The Test Matrix and the 3D Studies conducted based on the Test Matrix.

TEST MATRIX

- **Summary:** A matrix containing all possible options for 3D testing purposes both subjective and technical. The matrix consists of 6 main categories:

  - Content Type
  - Individual Types/Differences
  - Testing Times
  - Hardware Types
  - Testing Scenarios
  - Testing Environment

- **Purpose:** To distribute to groups, institutions, etc. for usage in their own studies distributing either through a licensing agreement, publication, etc (TBD)

- **Status:** GOOGLE DOC input continues to be needed by ST5 members, etc.

3D STUDIES

- **Summary**: Using the Test Matrix, ST5 will condense the options/choices to create detailed specific studies, either subjective or technical, for use and reference by 3D@Home and the rest of the industry to assist in the development of quality 3D content.

- **Purpose:** To assist in the education and adoption of 3D by providing information in the forms of study reports, data, content, etc. produced by ST5 or in collaboration with partners, etc. to the Industry.

- **Status:** First 3D Study "3D Subjective Study" has been developed and a proposal has been submitted to the BoD for approval. Pending approval with certain areas/conditions met.

1st 3D SUBJECTIVE STUDY PROPOSAL

SUMMARY & PURPOSE

To assist in the adoption of 3D by providing non-technical study results to Home Entertainment content creators/owners on what should and shouldn't be done when creating 3D content for home viewing. At this time, no other study such as this exists.

To date, there have been a lot of scientific/technical studies regarding 3D which have utilized synthetic/scientific content. These studies have assisted in learning more about 3D for scientific and medical reasons but we have not seen how it has served any benefit to content producers/owners in the Hollywood industry. The Hollywood Industry is known to be divided into groups that each have certain roles and authority. Those that have the direct responsibilities to decide how/when/what 3D content is created for the home (Blu-ray, Broadcast, etc) are in non-technical roles unable to utilize current scientific studies and translate them into ways to benefit their Industry. These groups are usually Marketing and Creative groups. Current and past studies are not released and constructed in a way to be helpful to non-scientific audiences such as producers, developers, and owners of Home Entertainment content.

Therefore, it is the intention of this 1st 3D Subjective Test Study to utilize "real 3D content" that is developed for the home and conduct a study in "real 3D viewing environments" with consumer equipment and acquire subjective testing results that will assist the Home Entertainment Industry in understanding the negative effects of releasing bad 3D.

This first study will focus on picture, but future studies can/will focus on subtitles, graphics and other layers that affect the 3D experience.

BENEFITS

- **3D Adoption:** Assisting Home Entertainment content owners/producers of 3D content in understanding and learning more about what they should and shouldn't do, in a non-scientific language, will both directly and indirectly drive adoption of 3D in the home by utilizing the study results, relationships developed and assistance provided.

- **Test Content:** Content created for this study will be available for use by 3D@Home for future studies by other ST committees and/or for creating a licensing program for outside groups to subscribe to/purchase

- **Testing Methodology:** The Testing Methodology developed for this study can be utilized for further studies outside of ST5 and 3D@Home.

  There are many parameters that contribute to the perceived quality of 3D. The purpose of this proposal is to establish a testing method that can be used to systematically study independent controlled parameters in future studies.

  Testing the content requires that any influences of hardware and room environment be controlled. Hence, standardized conditions will be utilized.

MAIN AREAS

1. **CONTENT**
   - **SEE CONTENT TYPE AND TESTING METHODOLOGY**

2. **TESTING METHODOLOGY**
   - **SEE CONTENT TYPE AND TESTING METHODOLOGY**

3. **QUESTIONNAIRE**
   - **SEE CONTENT TYPE AND TESTING METHODOLOGY**

4. **SUBJECTS**
   - **Quantity:** 30
   - **Age:** 18-45
   - **Vision:** 20/25 in each eye. Screened for good vision either with or without optical correction. Screened for 40" of stereopsis

5. **HARDWARE**
   - Display: Manufacturer TBD
   - Display: Active
   - Display: 55"
   - Display: will be calibrated

6. **TESTING ENVIRONMENT**
   - **Background:** 50% reflective grey
   - **Illumination:** 100 lux provided on subject seating area
   - **Viewing Distance:** 2.5x the vertical screen height
   - **Viewing Angle:** perpendicular to middle of screen (different viewing angles not measured in this study because they primarily vary with hardware)

7. **DISTRIBUTION OF RESULTS (options or all)**
   - Publication
   - Conference inviting Home Entertainment Industry
   - Presentation directly to content owners/producers
   - Presentations at existing conferences

8. **STUDY LOCATION**
   - **Location:** Pacific University – VPI (Vision Performance Institute)

CONTENT TYPE AND TESTING METHODOLOGY

SUMMARY
In order to provide results for best use by the Hollywood and Home Entertainment Industry, the content type must synergize with their production interests/process.

Goal is not to create "bad" or "good" 3D but instead to recreate commonly used aesthetic choices/3D techniques that can be easily misused; thus creating a bad 3D experience.

By re-creating these chosen scenes in different variations, we can gather study/data from subjects that will in turn assist content owners/producers on how to better create 3D content.

CONTENT TYPE DEFINED/REQUIRED
- Length – No more than 5 minutes for each "clip", perhaps 1-2 minutes depending upon content to be assessed
- X amount of Genre's chosen that closely define the content type that exists for consumers/viewers in the market (ex: Action, Sports, Drama, Documentary).
- Within each Genre, one scene type will be independently and uniquely shot by a designated group/company decided upon
- For each scene, four Versions will be created utilizing different 3D techniques commonly used and displayed in the Industry today (how many techniques will be determined)

HOW WILL ABOVE BE ACHIEVED
- **GENRE** will be chosen based on input from 3D@Home members, Hollywood industry relationships, etc
- **SCENES** will be chosen based on research of genres and decided on by 3D@Home members, Hollywood industry relationships, etc
- **VERSIONS** will be decided based on research of currently released 3D material for the home available (blu-ray, Broadcast, etc)
    - o X amount of 3D Blu-ray feature discs will be reviewed
    - o X amount of 3D broadcast material will be reviewed
    - o Document commonly used 3D techniques and choose X amount for usage in versions
        - Example: Divergence, Convergence, Hypo/Hyperstereo, Depth changes, Cardboarding, etc.
    - o Take X amount of commonly used 3D techniques and create/shoot 4 different versions utilizing them all
        - Extreme
        - Aggressive
        - Medium
        - Restrained/Light

EXAMPLE OF ONE GENRE

GENRE #1 - Scene (A) using 3D Techniques X, X, X
Scene A / Version #1 – Extreme
Scene A / Version #2 – Aggressive
Scene A / Version #3 – Medium
Scene A / Version #4 – Restrained/Light

TESTING METHODOLOGY

- Subjects: 30 subjects
- Subjects will view each "GENRE" and all (4) "VERSIONS" of a "SCENE" within that same GENRE only, in random order arranged by Latin Square order to control order effects.
    o Rinse and Repeat: Subject will then move on to next "GENRE" and its VERSIONS
- Subjects will answer QUESTIONNAIRE after each "GENRE" and its VERSIONS which consists of:
    o Visual Symptoms questions (work in progress)
    o Immersion questions (work in progress)
    o In-Take questions (work in progress)

Visual symptoms questionnaire
WORK IN PROGRESS

Instructions: Thank you for helping us with our study. We would like to know how your eyes and your body feel right now. We are going to do so by asking you a few questions. For each question displayed on the TV screen, you just need to use the mouse to indicate how you feel by marking on an analog scale. For example, if the question is "How sleepy are you right now?" If you are not sleepy at all, you should mark a location on the scale close to "***not at all***;" if you are really sleepy you will mark a location close to "***extremely***." Do you understand it now?

Not at all	Mildly	Moderately	Severely	Extremely

1.   Did you feel physically uncomfortable in general?

2.   Did your eyes feel tired?

3.   Did your eyes feel a strain or pulling sensation?

4.   Did you feel your head is fuller or have headache?

5.   Did your feel disoriennation or vertigo?

6.   Did you notice blur in the scene you were viewing?

7.   Did you have trouble visually focusing on the scene?

8.   Did you feel dizziness?

9.   Did you see multiple images of the scene?

10. Did you see the images move, jump, swim or appear to float on the display?

11. Did you feel neck ache?

12. Did you feel tired or sleepy?

13. Did you have difficulty concentrating in the task?

14. Did you have difficulty thinking clearly?

15. Did you have trouble remembering what you had seen?

Immersion questionnaire

WORK IN PROGRESS

Instructions: We would like to know how you compare the two 3D videos you just saw. For each question please indicate your preference between the 2 videos you just viewed.

In which video did the objects felt most real as they moved through space?

#1 Best   #1 better   #1 slightly   equal   #2 slightly   #2 better   #2 best

In which video did you most feel like you were part of the movie?

#1 Best   #1 better   #1 slightly   equal   #2 slightly   #2 better   #2 best

In which video did the sensation of depth add most add value to the movie?

#1 Best   #1 better   #1 slightly   equal   #2 slightly   #2 better   #2 best

In which video did the depth sensation felt most real?

#1 Best   #1 better   #1 slightly   equal   #2 slightly   #2 better   #2 best

In-Take questionnaire

WORK IN PROGRESS

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