APPENDIX B: SIGNUP FORM

WAYFINDING AND MAP DESIGN
SIGN-UP FORM FOR PARTICIPATION

Purpose of the Study:

1. This study aims to observe actual navigation by recreational users in forested trails to gain understanding of the impact of environment cues and map designs on navigation**.**
2. Participants will find their own ways in an established trail and will be asked to say aloud their thoughts while trying to navigate on the trail.

Purpose of this form: This form is to obtain information regarding your experience level in hiking and other related information to determine if you meet our research criteria.

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1. Have you ever hiked in the **Pandapas Pond** area before? ☐Yes ☐No
2. Do you have a health problem that prohibits you from hiking for 1.5 hours? ☐Yes ☐No
3. How many times have you **navigated using a map** in a National Park or National Forest or any forest trails for the past 1-year? ☐Less than 2 times ☐More than 2 times
4. Do you consider yourself a novice in hiking and orienteering? ☐Yes ☐No

a. If No, please state why (e.g., used to be a scout, etc.):_____

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5. Would you like to take part in this study, which requires you to hike for 1.5 hours? ☐Yes ☐No

Please fill in your personal information

Name: _____ Email: _____

Contact number: _____ Dominant Hand: ☐Left ☐ Right

Your Gender: ☐Male ☐Female

THANK YOU FOR SIGNING UP, WE WILL CONTACT YOU SOON

If you have any questions or concerns, please contact **Boon Kee Soh** at email: **bsoh@vt.edu** or Tel: **961 2975**

APPENDIX C: INTERVIEW ELICITATION

Elicitation Interview

(Repeat these questions for each of the junctions 1 to 10)

Junction X

X.1. Tell me what you can remember thinking at Junction X. (Show the map and picture)(What were you thinking at Junction X?)

X.2. Tell me what information did you use at this junction to make your decision on which path to choose?

X.3. Did you know you were lost? (If participant was lost)

X.4. Any particular information from the environment that helps you in making up you mind? (Stream, signage, trail shape, slope)

X.5. Any particular information from the map that helps you in making up you mind? (Trail labels on map, contour lines, color of trail, stream symbol)

X.6. Describe the process how you make up your mind (if it is not clear from 1).

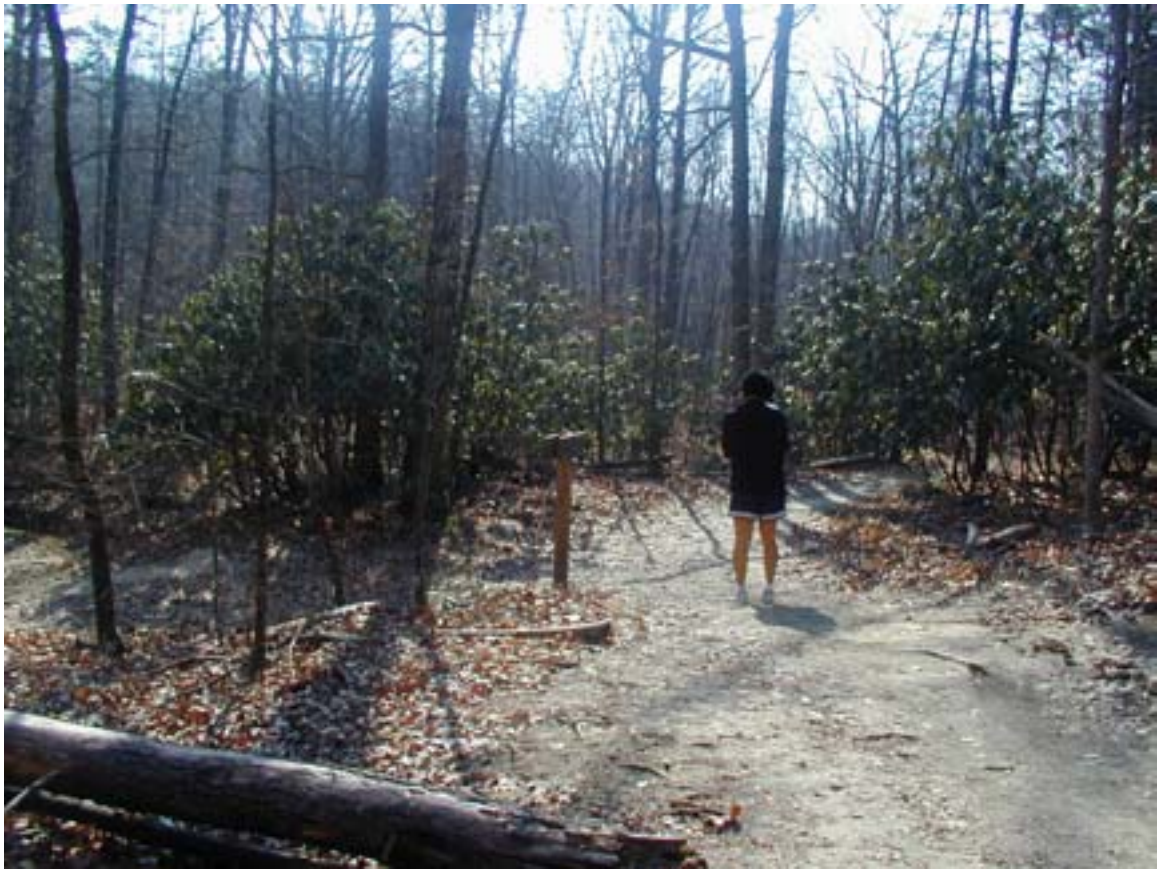
Trail segment X

X.7. Tell me what you can remember about your thinking during this segment of the trail.

(What were you thinking when walking in this segment of the trail?)

Junction 1

Junction 2



Junction 3

Junction 4

Junction 5

Junction 6

Junction 7

Junction 8

Junction 9

Junction 10

Junction 11 (End Point)

APPENDIX D: INFORMED CONSENT FORM

INFORMED CONSENT FORM

Title of Project: Investigation of Wayfinding Behavior in a National Forest (Study 1)
Principal Investigators: Tonya L. Smith-Jackson, Ph.D., Boon Kee Soh, Nicholas Buscemi, Madhukar Keer

PURPOSE OF PROJECT

You are invited to participate in a research project designed to explore how people use maps and trails.

INFORMATION

You will first have a test session in a parking lot near Whittemore Hall. This session is designed to help you to get used to the equipment and research protocols you will be involved in. After this session (lasting approximately 30 minutes), you will move to your experimental session at Jefferson National Forest. These sessions may or may not occur on the same day.

During the experimental session, you will be asked to use a map to complete a trail hike that lasts approximately 1.5 miles and is situated around the Pandapas Pond area of Jefferson National Forest. We will ask you to think out loud while you are hiking. You will be equipped with a head mounted camera, a helmet, a microphone, and a fanny pack containing video recording equipment. You will also be given water. At the end of the hike, you will also be asked to give your opinions and preferences and to complete several questionnaires. The session in Jefferson National Forest will take a total of 2 hours, and the entire session, including the practice session and travel to the test site will require about 3 hours.

The camera you will wear will give us information about what you are exploring and doing during the hike. A camera person will shadow you during the hike a short distance away. This person is acting as an observer and will be videotaping during your hike. We will use both types of video data (head mounted and observer video) for later analyses and possible use during meetings and presentations (see confidentiality discussion below).

RISKS

There are no physical or emotional risks associated with this research project that are above and beyond those risks occurring with routine outdoor activity. You will be monitored at all times during the hike by an observer who will shadow your movements throughout the hike. The research team is equipped with first aid and communications devices should an injury or other incidents occur.

BENEFITS

Benefits can be derived from knowing that you have contributed to the development of wayfinding support systems to protect the safety of recreational tourists. In addition, you can receive the results of this research directly from the experimenter after the data have been analyzed. You can use the contact information on the bottom of the form we will give to you.

CONFIDENTIALITY

The information gained in this research project will be kept strictly confidential. At no time will the researcher release the results of the study to anyone other than individuals working on the project without your written consent.

You will be identified only by a 3-digit study code. Data will be stored securely and will be made available only in the context of research publications and discussion. No reference will be made in oral or written reports which could link you to the data nor will you ever be identified as a participant in the project.

We are requesting that you provide permission via separate signature at the bottom of this form giving us permission to use the videos or portions thereof in public presentations or meetings where the results of this study will be discussed. Videos will be modified to block identifying characteristics such as your face or a name on a shirt or blouse. **If you do not want us to use the videos please do not sign the "video" consent section. If you sign to give permission, but change your mind later, you are free to contact the experimenter to withdraw your written permission.**

COMPENSATION

If you are a student in Introduction to Psychology, you will receive 2 research credits for participation. If you are not a student in Introduction to Psychology, you will be compensated at the rate of $7.50/hour. Compensation will be given when the entire research session has been completed.

FREEDOM TO WITHDRAW

You are free to withdraw from this study at any time without penalty. If you withdraw before completing the session, you will be compensated for the portion of the time you spent participating in the study. You are also free to choose to leave questions blank that you do not feel comfortable answering.

APPROVAL

This research project has been approved, as required, by the Institutional Review Board for Research Involving Human Subjects at Virginia Polytechnic Institute and State University and by the Grado Department of Industrial and Systems Engineering and the Department of Psychology.

PARTICIPANT'S RESPONSIBILITIES

It is very important that you keep the activities and information discussed confidential, since others will be participating in this research.

QUESTIONS

If you have questions, or do not understand information on this form, please feel free to ask them now.

PARTICIPANT'S PERMISSION (General)

I have read and understand the Informed Consent and conditions of this project. I have had all questions answered. I hereby acknowledge the above and give my voluntary consent for participation in this project.

If I participate, I may withdraw at any time without penalty.

Signature

_____

Date _____

PARTICIPANT'S PERMISSION (Use of Video)

I agree to allow VT researchers to use videos resulting from this research in public meetings and presentations. I understand that any identifying features will be blocked or covered to protect confidentiality.

I understand that by signing below, I am providing permission to use any video data resulting from my participation.

Signature _____

Date _____

CONTACT

If you have questions at any time about the project or the procedures, you may contact the principal investigators, Tonya L. Smith-Jackson at 231-4119 or smithjack@vt.edu (519-H Whittemore) or Boon Kee Soh at bsoh@vt.edu.

If you feel you have not been treated according to the descriptions in this form, or your rights as a participant have been violated during the course of this project, you may contact Dr. David M. Moore, Interim Chair of the Institutional Review Board Research Division at 231-4991 or moored@vt.edu.

May we contact you for future studies related to wilderness recreation? If yes, please provide your name, address, phone, and/or email address below:

APPENDIX E: INSTRUCTION TO PARTICIPANTS

PLEASE READ THIS INSTRUCTION

1. Imagine you are interested to hike in the Pandapas Pond (see Map on opposite side) and you are traveling towards it on US460.
2. You planned to walk on the path marked out on the map.
3. You are **not supposed to walk into vegetation** and **should be on established walking trails**. There is no need for you to walk on dangerous slopes or crossing deep water.
4. **Not all trails are graveled and wide; most of them only allow one person to walk on them and are not meant for vehicle.**
5. You will be told your starting point once you are at the parking area and will be told the direction on the path to follow.
6. The experimenter will not help you in anyway once you start walking. You are to navigate using the map ALL ON YOUR OWN.
7. One experimenter will follow you and record your action along the way.
8. You are to say aloud what you are thinking all the time while doing the task. For example, the information you use to decide which path you are choosing, the map features you are looking at, the terrain and vegetation you are seeing, etc. This is as if you are saying out loud what you say silently to yourself.
9. You are not allowed to talk to anyone on the trail or to ask for help from passerby and the experimenter behind.
10. Water will be given to quench thirst along the way.
11. **Follow the map closely and refer to the map as much as possible**

APPENDIX F: THINK ALOUD PRACTICE

THINK ALOUD PRACTICE

Basically we are interested in what you say to yourself as you perform some task. In order to do this, we want you to TALK ALOUD as you work on your problem. What I mean talk aloud is that I want you to say out loud everything you say to yourself silently. Just act as if you are alone in a room speaking to yourself. Do you understand so far? Good.

1. Now I want you to say aloud everything you are thinking while you solve a multiplication problem. Are you ready?

   What is 24X36?

2. You will be shown an anagram to solve. This is a set of letters of a word where the sequence is jumbled. You are to say aloud what you are thinking where trying to rearrange the letters to form the word. For example, OKOC, you may see that the word is COOK.

   Example: OKOC is COOK

   Solve: **NPEPHA**

3. Say aloud what you are thinking while you count the number of windows in your house when you were 12 year old.

APPENDIX G: POSTTEST QUESTIONNAIRE

PROJECT QUESTIONNAIRE

Instruction:

1. Please answer the questions below to the best of your knowledge.
2. Ask the experimenter if there is any query.

Name:_____ Age: _____

Highest Educational Level: _____

i. How many times have you visited an outdoor area to **hike** per year? _____

ii. How many times have you used a map in outdoor areas? _____

iii. Do you use compass when you go hiking? ☐Yes ☐No

iv. Do you consider yourself a novice in hiking? ☐Yes ☐No

v. Are you a native English speaker? ☐Yes ☐No

vi. Where do you mainly live for the last 20 years? _____

---

1. How clear is the designated trail on the map?

☐Very clear ☐Clear ☐Unclear ☐Very unclear

2. Did the trail on the map help your to navigate? ☐Yes ☐No

2a. Why:_____

_____

3. How clear are the water features on the map?

☐Very clear ☐Clear ☐Unclear ☐Very unclear

4. Did the water features on the map help you to navigate? ☐Yes ☐No

4a. Why:_____

_____

5. Did you find the map easy to use?

☐Very easy ☐Easy ☐Difficult ☐Very Difficult

6. When you navigated on the trail, did you rotate the map while you walk?

☐Yes ☐No

6a. How did you hold the map (e.g., held in a certain orientation. Please describe.)? _____

6b. Why? _____

7. Did you lose your way during the hike? ☐Yes ☐No

7a. If Yes, why do you think you lost your way?

_____

_____

8. Were the trail signs helpful when you were navigating? ☐Yes ☐No

8a. Why?_____

_____

9. Do you think you need a compass for the hike you just completed?

☐Yes ☐No

9a. Why? _____

_____

10. Did you find the map useful?

☐Very useful ☐Somewhat useful ☐Not very useful ☐Not useful at all

11. Do you think there is anything that needs improvement on the map?

☐Yes ☐No

11a. Reason: _____

_____

12. Do you need any contour information to navigate? (e.g. contour lines to tell you the slope of the terrain)

☐It will be very helpful ☐Maybe helpful ☐I can do without ☐What is that?

13. If you were given other maps, which would you prefer (ask the experimenter for samples)?

☐ Contour Map ☐ Schematic Map ☐Shaded Relief Map

13a. Why?_____

_____

14. Any other comments about the map you used or the samples you have now?

_____

_____

_____

THANK YOU FOR YOUR PARTICIPATION

APPENDIX H: WAYFINDING PERFORMANCE RAW DATA

Table of Raw Data (i)

Subject	MAP	Shaded	Schematic	Color	AGE	Gender	EXP
1	6	1	0	1	25	F	1
2	4	0	0	1	21	M	0
3	2	0	1	1	19	M	1
4	6	1	0	1	19	F	0
5	6	1	0	1	18	M	0
6	2	0	1	1	18	M	0
7	3	0	0	0	19	M	0
8	4	0	0	1	22	M	1
9	1	0	1	0	26	M	0
10	6	1	0	1	22	M	0
11	1	0	1	0	25	F	1
12	3	0	0	0	19	M	0
13	5	1	0	0	23	M	0
14	5	1	0	0	29	F	1
15	1	0	1	0	23	F	1
16	4	0	0	1	23	M	1
17	1	0	1	0	22	M	0
18	2	0	1	1	29	M	0
19	3	0	0	0	27	M	1
20	4	0	0	1	25	M	1
21	4	0	0	1	23	M	0
22	2	0	1	1	26	M	1
23	1	0	1	0	28	M	1
24	5	1	0	0	21	M	0
25	3	0	0	0	24	M	0
26	2	0	1	1	30	M	0
27	4	0	0	1	23	M	0
28	6	1	0	1	36	M	1
29	3	0	0	0	23	F	1
30	1	0	1	0	24	M	1
31	2	0	1	1	22	F	1
32	5	1	0	0	24	M	1
33	5	1	0	0	24	M	0
34	3	0	0	0	24	M	1
35	5	1	0	0	19	F	1
36	6	1	0	1	22	M	1

Table of Raw Data (ii)

Country	Culture	Dom_Hand	TimeComp	DM1	DM2	DM3
India	1	R	3552	4	17	1
USA	0	R	2933	14	7	6
USA	0	R	2652	4	2	10
PuertoRico	1	R	3542	7	16	27
USA	0	R	3234	14	15	7
USA	0	R	3948	1	20	18
USA	0	R	2955	4	37	22
USA	0	R	3403	3	16	41
Italy	1	R	3286	7	6	15
India	1	L	3110	9	13	32
China	1	R	3343	1	7	12
USA	0	R	2929	6	8	9
USA	0	R	3103	27	28	14
USA	0	L	4443	88	55	23
USA	0	R	3380	21	29	15
India	1	R	3921	14	9	13
USA	0	R	3399	24	6	5
Korea	1	R	3685	2	20	15
China	1	L	3553	5	10	4
China	1	R	3523	1	13	16
Indonesia	1	R	3574	5	16	11
China	1	R	3661	7	7	19
China	1	R	4158	1	15	43
India	1	R	3519	8	9	24
China	1	R	3866	182	24	112
China	1	R	3589	3	71	29
India	1	R	4146	31	1	53
Thailand	1	R	3900	4	15	21
Thailand	1	R	4039	7	29	118
India	1	L	3611	8	27	44
USA	0	R	3417	13	7	13
USA	0	R	4591	95	42	11
India	1	R	3608	1	64	2
India	1	R	3249	6	33	63
USA	0	R	3937	82	25	17
Ecuador	1	R	3685	34	3	16

Table of Raw Data (iii)

DM4	DM5	DM6	DM7	DM8	DM9	DM10	TotalDM
145	75	132	8	94	78	1	555
36	140	41	26	13	2	1	286
11	38	11	15	17	7	7	122
61	21	136	14	9	4	3	298
30	38	52	50	1	5	11	223
16	48	32	8	93	1	1	238
17	70	61	34	9	1	1	256
68	126	48	48	36	19	9	414
80	27	44	29	33	7	1	249
16	26	24	45	2	1	1	169
30	73	11	87	136	10	1	368
42	46	12	8	4	1	2	138
41	35	13	13	4	1	1	177
143	122	61	68	15	11	16	602
154	97	131	46	33	5	1	532
91	52	36	6	8	1	1	231
82	22	18	41	26	1	1	226
24	167	12	17	20	8	1	286
3	19	12	7	14	1	1	76
24	207	84	1	13	1	7	367
146	22	83	39	4	1	1	328
162	109	47	6	16	7	1	381
76	33	115	53	32	1	1	370
33	61	14	20	5	4	1	179
38	325	162	7	92	1	9	952
39	133	43	1	1	1	1	322
118	240	29	10	69	1	9	561
20	17	44	21	18	1	1	162
50	52	38	99	63	3	6	465
63	45	184	14	2	1	1	389
28	25	23	4	4	1	8	126
364	152	20	9	3	1	1	698
12	56	53	19	15	10	1	233
37	19	50	58	16	17	22	321
107	110	54	27	19	1	6	448
107	52	30	29	18	1	13	303

Table of Raw Data (iv)

Dev1	Dev2	Dev3	Dev4	Dev5	Dev6	Dev7	Dev8
0	0	184	0	0	0	0	140
0	0	0	0	0	0	0	94
0	0	0	98	0	0	0	0
89	0	0	63	151	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	183	0	0	0	0
0	0	0	0	125	0	0	104
0	0	0	166	0	0	0	128
0	0	0	170	0	0	0	0
150	0	0	174	134	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	170
0	0	0	0	0	0	0	0
253	0	0	162	211	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	405	0	0	0
174	0	161	219	0	0	0	129
120	0	0	70	155	0	0	0
0	0	0	0	334	0	0	129
0	0	251	12	265	0	0	0
183	0	0	149	0	0	0	0
0	0	0	295	170	0	0	0
0	138	0	0	307	0	0	0
0	0	0	0	120	0	0	157
0	0	0	283	0	0	0	140
0	0	150	140	136	203	203	112
0	0	0	188	195	0	0	0
149	0	0	0	108	0	0	86
0	0	0	230	0	0	0	0
0	0	0	0	92	0	0	114
157	78	185	0	80	0	0	214
0	0	0	0	0	0	0	0
0	0	0	0	155	0	0	0
0	0	0	0	0	0	0	0

Table of Raw Data (v)

Dev9	Dev10	otalDeviate	Accu1	Accu2	Accu3	Accu4	Accu5
0	0	324	1	1	0	1	1
0	0	94	1	1	1	1	1
0	0	98	1	1	1	0	1
0	0	303	0	1	1	0	0
0	0	0	1	1	1	1	1
0	0	0	1	1	1	1	1
0	0	0	1	1	1	1	1
0	0	183	1	1	1	0	1
0	0	229	1	1	1	1	0
0	0	294	1	1	1	0	1
0	0	170	1	1	1	0	1
0	0	458	0	1	1	0	0
0	0	0	1	1	1	1	1
0	0	170	1	1	1	1	1
0	0	0	1	1	1	1	1
0	0	626	0	1	1	0	0
0	0	0	1	1	1	1	1
0	0	405	1	1	1	1	0
0	0	683	0	1	0	0	1
0	0	345	0	1	1	0	0
0	0	463	1	1	1	1	0
0	0	528	1	1	0	0	0
0	0	332	0	1	1	0	1
0	0	465	1	1	1	0	0
0	0	445	1	0	1	1	0
0	0	277	1	1	1	1	0
0	0	423	1	1	1	1	0
0	0	944	1	1	0	0	0
0	0	383	1	1	1	0	0
0	0	343	0	1	1	1	0
0	0	230	1	1	1	0	1
0	0	206	1	1	1	1	0
0	0	714	0	0	0	1	0
0	0	0	1	1	1	1	1
0	0	155	1	1	1	1	0
0	0	0	1	1	1	1	1

Table of Raw Data (vi)

Accu6	Accu7	Accu8	Accu9	Accu10	TotalAccu
1	1	0	1	1	8
1	1	0	1	1	9
1	1	1	1	1	9
1	1	1	1	1	7
1	1	1	1	1	10
1	1	1	1	1	10
1	1	1	1	1	10
1	1	1	1	1	9
1	1	0	1	1	8
1	1	0	1	1	8
1	1	1	1	1	9
1	1	1	1	1	7
1	1	1	1	1	10
1	1	0	1	1	9
1	1	1	1	1	10
1	1	1	1	1	7
1	1	1	1	1	10
1	1	1	1	1	9
1	1	0	1	1	6
1	1	1	1	1	7
1	1	0	1	1	8
1	1	1	1	1	7
1	1	1	1	1	8
1	1	1	1	1	8
1	1	1	1	1	8
1	1	0	1	1	8
1	1	0	1	1	8
0	0	0	1	1	4
1	1	1	1	1	8
1	1	0	1	1	7
1	1	1	1	1	9
1	1	0	1	1	8
0	1	0	1	1	4
1	1	1	1	1	10
1	1	1	1	1	9
1	1	1	1	1	10