The Edward S. Rogers Sr. Department
of Electrical & Computer Engineering
UNIVERSITY OF TORONTO

Informed Consent Form

Title: Hyperspectral Video Analysis for Skin Health and Beauty

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1. Introduction

You are invited to participate in a research study that will investigate the feasibility of skin analysis with hyperspectral images reconstructed from the normal RGB images captured from a normal smartphone.

Please read through the description of the experiment, the procedure you will be participating in, and the confidentiality notes in this study. If you have any questions, do not hesitate to ask the study staff to explain anything you do not understand. **Please understand that participation in this study is entirely voluntary: you may leave the study at any time, with no negative consequences on you as the participant.**

2. Background and Purpose

This project aims to 1) reconstruct the hyperspectral images from RGB image captured by consumer grade smartphones or any end-user devices; and 2) apply the advanced hyperspectral imaging (HIS) analysis techniques to predict users' skin information, such as hemoglobin, oxygen saturation, melanin, skin hydration, skin sebum.

Skin analysis is important for us to understand our skin condition before selecting useful skin products. However, many skin analysis solutions rely on expensive clinical and laboratory equipment, which are not readily available to the end users. Specifically, a skin camera enabled by spectroscopic technology is used under a control environment to extract users' skin information. Through spectroscopic technology, hyperspectral images can be acquired, these images are capable of unveiling richer information of a skin image through different wavelengths beyond the visible spectrum. However, capturing hyperspectral images needed to be conducted in a control environment as the skin analysis is very sensitive to illumination and environmental (ambient light) changes. On the other hand, capturing selfie image has become a common activities for many people through their smartphone's camera. Smartphone-based skin analysis can benefit many people who want to get a quick overview of their current skin condition before researching useful skin products that can improve their skin condition.

3. Study Procedure

Subjects 18 years and older are eligible to take part in this experiment. The data collection campaign will involve acquiring hyperspectral image, standard RGB image, and skin image from hyperspectral camera, smartphone's camera and cosmetology camera.

The data collection campaign employs the following three cameras:

1. A hyperspectral camera to capture the hyperspectral images at different wavelengths (350-1000nm). This camera will be mounted on a tripod and the image capture will be triggered from a distance through a remote control.
2. A smartphone camera to capture standard RGB images. The data collected from this camera will be used to facilitate the development of 1) hyperspectral image reconstruction. And the reconstructed image will be used for 2) skin analysis (for experimental study and mobile application development)
3. A skin camera that provides cosmetic information of a skin. The data collected from this camera will be used as groundtruth facilitating the 2) skin analysis (for groundtruth labelling).

The data collection will be taken placed in a **laboratory environment (Multimedia Lab in Bahen Building)**, where the above three camera will be setup as follows:

1. The hyperspectral camera will be mounted on a tripod.
2. The smartphone camara will also be mounted on a tripod, placing besides the hyperspectral camera.

3. The skin camera will be held by participant hand, and the participant will be given a briefing on how to operate the camera and the skin spot to be captured.

A short briefing will be given to ensure that all participants are aware of the data collection procedures, and they agree to share their data for research purposes. Two data collection produces will be followed.

1. For the first experiment, the image acquisition includes the use of hyperspectral and smartphone's cameras. The participant is required to sit in a designated chair. The participant should remain still during the image acquisition process. The investigator will signal the start of the image acquisition verbally, and the image acquisition will then be triggered from a distance through a remote control. Both hyperspectral and smartphone's cameras will capture the image simultaneously when the acquisition button is pressed. Three images of the facial skin will be captured. The entire image acquisition process should not taken longer than 15min.
2. For the second experiment, the image acquisition include the use of a handheld skin camera. The participant will be given a short briefing on how to use the camera and the skin spot required by the experiment. The investigator can provide a short demo, if required. The participant is then required to operate the skin camera by themselves and take the images of the marked skin spots. The skin camera will be disinfected before and after the image acquisition process. The entire image acquisition process should not taken longer than 15min.

This data collection campaign considers the compliance to the Covid-19 protocols a serious matter and any participant that are unable to follow the Covid-19 protocols will be automatically withdraw from the study. Please note that before conducting the experiment, these steps will be followed:

1. COVID-19 screening process and precautions (e.g. screening questions and wearing facial mask/shield, hands/desk sanitization)
2. The participants (who are mainly UofT grad/undergrad students) will be asked to perform self-assessment (UCheck) before coming to the Uoft premises.
3. Collection of personal contact information, as required by public health and the University (e.g. Name, phone, address) for contact tracing.

4. Risks and Benefits

Participants are familiar, through their every day activities, with cameras, and there are no physical, psychological, social, or legal risks involved in this study. During the experiment, participants will be asked to notify investigators if they feel discomfort for any reason. Each participant will be engaged for approximately 0.5 hour (15min for each part). Participants will be compensated at the rate of $20/hr, plus $10 bonus for good performance. Hence, the maximum compensation is $20 per participant for a data collection that last 30min. If a withdrawal should occur, participant will be compensated on a pro-rated basis at $20 per hour, for the participant's involvement to that point.

The Covid-19 Research risk level is level 2 according to the F2F research methods identified by REB (link: https://research.utoronto.ca/covid-19-research-innovation-updates/u-t-guidance-recovery-human-research-during-covid-19-pandemic). There are minor physical contact to collect the skin data, in case the participant encounters problem in using the skin camera. Otherwise, the investigator will minimize the possibility of physical contact by only passing the disinfected skin camera to the participant through a distance. Above all cases, the investigator will attempt to avoid possible physical contact and maintain at least 2m physical distancing. On the other hand, all participants are required to comply with the Covid-19 protocol defined by the Public health measures and University practices. Please note the following:

- Research site is located Multimedia Laboratory, under the jurisdiction of Ontario public health. We are taking all safety precautions to reduce the risk of spread of COVID-19 and expect the participant to follow public health directives as well.
- If the participant feel that he/she is from a vulnerable group with respect to COVID-19 effects (e.g., senior, immuno-compromised), please discuss the possible participation with the research team before consenting. The participant is under no obligation to participate and nothing bad will happen if you change your mind about participating in the research.
- Because the participant is coming onto campus, the following safety protocols must be followed, as per Occupational Health and Safety (see Vaccination Guidance for Human Participant Face-to-face (F2F) Research).
- We will be collecting personal contact information that we must retain in order to follow up with the participant and/or conduct contact tracing if the participant may have been exposed to COVID-19 in coming to the research site.
- Contact information will be kept separate from data collected through the research study to allow for de-identification of the research data (if applicable, as detailed in the protocol).
- The participant maintains his/her right to withdraw from the study at any time, including research data (if applicable). If the participant does withdraw, we will continue to maintain his/her contact information and will only give it to Occupational Health if required for contact tracing.
- We cannot guarantee anonymity as the personal contact information identifies a participant.

5. Confidentiality

All the signals collected for this study will be totally anonymized and kept in a database that does not indicate the participant's name or address, or any information that directly identifies them. The data from each participant will be given a unique ID that does not reveal any personal information of the participant. The database will be securely stored in lab equipment that is only administered and accessible by the PI and the research team.

Only a file linking ID’s to participants and their contact information will be stored privately in case a participant needs to be contacted later for any reason, or if they request to withdraw from the study. This private file is encrypted and only accessible to the supervisor and the investigators. Participants will not be identified by name in any future publications or presentations that result from this study.

The data and consent materials obtained from this study may be reviewed by a representative of the Human Research Ethics Program (HREP) for quality assurance to ensure required laws and guidelines are followed. If this is the case, all information accessed by the HREP will be upheld to the same level of confidentiality that has been stated by the research team.

Questions about the Study

If you have any questions, concerns or would like to speak to the research team for any reason, you can address them to the experimenters or the principal investigators, Prof. Konstantinos N. Plataniotis, tel: 416-946-5605, email: kostas@ece.utoronto.ca.

If you have any questions about your rights as a participant, please contact the Research Oversight and Compliance Office - Human Research Ethics Program at ethics.review@utoronto.ca or 416-946-3273. This group is not part of the study team and oversees the ethical conduct of research studies. Everything you discuss with them will be kept confidential.

Consent

I have read the above information and understand the study, its procedures, risks and benefits, and confidentiality. All questions I had have been answered. I understand that I may withdraw from this study at any time.

Please sign below:

Participant's Printed Name	Participant's Signature	Date