CHAPTER 3

METHODOLOGY

3.1 Introduction

In this chapter, the methodology for the development of an initial assessment method for facial nerve paralysis will be discussed. The goal of this study is to develop an assessment method which is capable in grading the severity of the paralysis. For the facial tracking process, the Kanade-Lucas-Tomasi (KLT) optical flow algorithm was applied to track the motion of desired landmarks on the face over time. No markers were attached on the subject’s face to aid tracking. A few experiments were conducted to select the best measurement parameter for the possible implementation towards facial nerve assessment. The flow of the methodology of this research is presented in Figure 3.1.

3.2 Ethical Statement

All the procedures in this study were approved by the Medical Research and Ethics Committee (MREC), Ministry of Health, Bangsar, Kuala Lumpur, Malaysia (Ref no.: KKM/NIHSEC/800-2/2/2/P13-96) (Appendix). All subjects were provided with the Patient Information Sheet and Patient Consent Form before the data acquisition process begun. The Patient Information Sheet is the document containing information about the intended research for prospective subjects whereas the Patient Consent Form is a form to document the subject’s consent to participate in this study.
3.3 Equipment Installation and Experimental Setup

For the experimental setup, no standard is available for collecting the video databases. So, protocol for the experiment is made based on the requirement for the research purpose. For collecting the facial exercises data, a digital camera (SONY DSC-W620) with $640 \times 480$ resolution was used to capture the videos of the subject's face from the frontal view at the center of the face. The digital camera was placed in front of the subject and distance between the subject and the camera was 1.0 meter. This value of the distance is most suitable in capturing the video of the full head and partial shoulder of the subjects. Two different locations of experiment have been decided for normal and patient subjects. The experiment for normal subjects
was carried out in a good lighting condition in a laboratory of Universiti Malaysia Perlis (UniMAP) whereas the experiment for patient subjects was carried out in the physiotherapy department of Hospital Tunku Fauziah (HTF). The space for this experiment is limited and requires additional lighting support. Hence, a lighting source of white light was added to improve the video capturing. The white light used for lighting is not in any way harmful to the patient. The luminance of the light is 12 kcd/m² and the wattage is only 11W.

3.4 Landmarks Chosen and Facial Exercise Development Based On Muscle Movement and House-Brackmann (HB) Score

In this study, the HB grading system was used as a reference score in assessing the facial nerve functions. It is the grading system which is the most used by clinicians all over the world as stated before in Chapter 2. The HB grading consists of three main parts of our face which is the forehead, eyes and mouth parts. The movement of these three parts has covered all of facial muscles. To evaluate these three parts, a study was designed to choose some desirable landmarks based on both muscle movements and also the HB score. The selection of the landmarks which have to be tracked later is a very crucial procedure since the goal of this study is to evaluate the facial nerve functions whether they are in normal condition or otherwise. The landmarks in Table 3.1 and Table 3.2 have been chosen by considering the muscle movement and the selection was agreed by a medical professional at the Otorhinolaryngology Department from Hospital Tunku Fauziah (HTF), Kangar. For Rise Forehead Exercise, the muscle involved is Frontalis. To evaluate the functionality of this muscle, the landmarks are placed based on the movement of the exercise. Rise Forehead Exercise is a movement of eyebrows or