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MODELING LIP ANIMATION BASED ON 4$^{\text{TH}}$ ORDER POLYNOMIAL FUNCTION

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ABSTRACT

Lip movement synthesis plays an important role to realize a natural human-like face of computer graphic since speech intelligibility can be improved by adding lip images to the speech signal. Visual speech synthesis research has begun since early 1990s. It has been emergent rapidly and its applications are widely use in many areas. For example, visual speech synthesis has been used in human communication and perception area, and virtual talking head in cartoon or game applications area. This study applies parameter based technique in developing visual speech synthesis. A parameter based technique for facial animation overcomes some of the limitations and restrictions of simple interpolations. This technique allows any possible face and expression by a combination of independent parameter value. In this study, 4th order polynomial is proposed to be applied on visual speech synthesis. Previous researcher had applied 6th order polynomial on visual speech synthesis. However, higher order polynomial is known to be wild and wiggly. In order to minimize the synthesization, the visemes have been classified and put into groups. Three control points were set up as parameter and they are labeled with X1 which represents point at the right corner lip, H1, point at the center of upper lip and H2 which is point at the center of bottom lip. These control points play very important role in producing result. Viseme is grouped based on the control point motion. The control points also have been used in obtaining correlation coefficient for 4th order polynomial function. For the lips motion, naturalness is measured base on how similar the synthesized to the real lips deformation. The similarity between both motions is indicated by the correlation coefficient measurement. Then the correlation coefficient between the synthesized and actual motion curve of lips control points of the all control points are calculated. The results show that the value of correlation coefficient is very close to 1 (about 0.9 and above). The value represents how close the function fits the original data. The proposed 4th order polynomial function achieves high realism in visual speech synthesis system, based on results that had been collected from experiment. The quality of synthesized motions can be evaluated by how much they imitate the real motion of lips.

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