論　文　要　旨
Thesis Abstract

（yyyy/mm/dd）　　2020 年　3 月　13 日

※報告番号	甲 第 266 号	氏　名 (Name)	MUHAMMD NUR ADILIN BIN MOHD ANUARDI

主論文題名　（Title）

COGNITIVE TASK ANALYSES FOR EFFECTIVE COMMUNICATION SYSTEMS USING NIRS MEASUREMENT

内容の要旨　（Abstract）

Communication systems always keep evolving with technology. Communication systems nowadays not only involved living things but also communication between living things and non-living things. However, several challenges occur such as limitation application on the robot in the aspect of cognitive. Cognitive play a crucial role in communication systems. By enhancing cognitive ability, human communication systems can be improved. Besides, by observing the cognitive process, the whole systems of communication can be advanced to robot communication systems.

This dissertation mainly focuses on two cognitive processes: emotion and working memory. Most of the cognitive studies only consider psychological effects. Therefore, this dissertation will discuss the cognitive task effects on brain functions by using brain imaging techniques. The tasks based on the cognitive processes has been designed. We recruited Japanese native speaker for performing the task while their brain activity been observed using near-infrared spectroscopy (NIRS) brain imaging technique.

Language area of the brain which always located at the left hemisphere of the brain has been focused. A language sounds that could not be understood by the subject, which is Malay language and the reversed Japanese language, had been induced with emotion. The subjects listened to the language sounds and guess the emotion intended. The brain observation results proposed that emotion is important in some situation for communication with familiar language. On the other side, emotion might be also an obstacle, especially for new language acquiring.

In term of working memory, we investigated different background colours effects on brain activity. Circle counting task (CCT) and reading span task (RST) has been designed on different background colours. The subjects performed the tasks on the tablet while their prefrontal cortex of the brain been observed using NIRS. The prefrontal cortex of the brain corresponds to the working memory area. The measurement results suggested different background colour affects brain activity in varied ways.

Common background colour with black text, which is white background colour, could be used to enhance working memory especially for those who experienced ability deterioration. However, the combination of blue-green background colour and black text may be preferable for improving users' task performance. Both cognitive processes study results may be utilised in several fields including medical therapy, communication technology advancing and even improving the quality of people's lives, where all of these tools concern effective communication systems.

※official use only