

# 2006 年度博士論文概要一覽



## システム科学専攻

### Study on Human Binocular Fusional Area

秦 大 珉 (Damin Qin)

In three-dimensional display systems, binocular disparities must be limited within a certain fusional area, called as “Panum’s fusional area”. Otherwise, too larger or unsuitable disparity could cause double view or serious eye fatigue. The limits of Panum’s fusional area have been determined by many studies. The limits of horizontal and vertical meridian were frequently studied. However, the limits of Panum’s fusional area in the other oblique directions, such as 45, 135, 225 degrees etc., were seldom measured. Therefore, it is necessary to fully measure the disparity limits of Panum’s fusional area in more directions.

The following results were obtained: (1) in central vision, the horizontal disparity limit is larger than the vertical limit. (2) Panum’s fusional area is approximately symmetrical around the horizontal meridian. (3) However, it is not symmetrical around the vertical meridian; the nasalward disparity limits are obviously larger than temporalward disparity limits. (4) Therefore, the form of Panum’s fusional area in fovea could be suggested to be an ellipse off-centered toward the nasal side on the horizontal meridian. (5) In other experiments in peripheral vision of 3 degrees and 6

degrees, also, the disparity limit in horizontal meridian is larger than that in vertical meridian; the binocular fusional area is symmetrical about horizontal meridian and is not symmetrical about vertical meridian; the nasalward disparity limits are larger than the temporalward disparity limits. (6) The size of the binocular fusional areas increases with the increase of retinal eccentricity, and the increase of disparity limit on horizontal meridian is faster than that on vertical meridian.

### Artificial Immune System and Its Applications

戴 紅 偉 (Hongwei Dai)

The immune system contains many useful information-processing abilities, including pattern recognition, learning, memory and inherent distributed parallel processing. For these and other reasons, the immune system has received a significant amount of interest to use as a metaphor within computing. This emerging field of research is known as Artificial Immune Systems (AIS).

In my thesis, there are two main types of AISs.

One is 。 - Affinity based lateral interaction AIS model。7. In our previous works, we used winner-take-all (WTA) rule to express competition process

among immune cells. However, the WTA rule does not accord with natural immune response to some extent. In natural immune system, immune cells with different receptors can respond to invaded antigen with different strength. Hence, we built a neighborhood set composed of the best match immune cell and other high affinity cells to simulate this immune response process.

The other is .- Improved clonal selection theory based AIS. In this model, not only random point mutation but also receptor editing is performed to improve mutation affinity during affinity maturation process.

We apply these models to pattern recognition and optimization problems to test their performance. Simulation results show that these proposed AIS have better performance than our previous models.

## ファジィコントローラの学習法に

### 関する研究

唐 国 峰

ファジィ制御は熟練技術者の運転知識と言語を表現することによって行われ、熟練者の知識をファジィプロダクション形式で表現できれば、熟練者と同等の制御結果が得られる。しかしながら、熟練者の知識を忠実にファジィプロダクション形式で表現することは困難な問題である。熟練者の知

識を忠実に表現するために、ファジィコントローラに対する学習を必要である。本論文では、ファジィコントローラの学習法として、局所探索法と黄金分割探索法を提案した。更に、提案法を用いてファジィコントローラを倒立振子問題に適用することによって提案した学習法の有効性と改善したファジィコントローラの制御性能を示す。

## 物質科学専攻

Photocatalytic Degradation of Phenol by Visible Light-Responsive Fe-Doped and Fe(III)-Added TiO<sub>2</sub> suspensions and Development of Pilot-Scale Photocatalytic Reactor

Mst. Shamsun Nahar

Fe<sub>x</sub>TiS<sub>2</sub>の焼成により得られた鉄ドーピング二酸化チタン(x:0.005)は、水中のフェノール分解に対して最大の可視光応答性を持つと同時に紫外光活性も上昇した。二酸化チタン(P25 TiO<sub>2</sub>)とFe(ClO<sub>4</sub>)<sub>3</sub>(Fe(III):0.5 mM)の混合光触媒もフェノール分解に対して可視光応答性を示した。両光触媒の可視光応答性の理由を調べた。混合光触媒を用いるパイロット規模の光触媒分解-二酸化チタン分離装置を製作し、分解後、二酸化チタンを自然沈降させた。

## エネルギー科学専攻

## CHARACTERISTICS OF MICRO-BUBBLES, SUB-MICROMETER EMULSIONS AND NANO-SUSPENSIONS PRODUCED BY A NEW MOTIONLESS MIXER AND A HIGH PRESSURE WET-TYPE JET MILL

ISURU NISHANTHA SEEKKUARACHCHI

本論文は3部から構成されている。表記の2つの分散装置を用いて生成したサブミクロンエマルションの特性と生成機構を明らかにした(第1部)。表記の2つの分散装置を用いた液中ナノ粒子凝集体の細分化特性とナノ粒子凝集体の分散機構およびナノ粒子の機械的凝集機構を解明した(第2部)。新静止型混合器ラモンド・スーパーミキサーにより連続的に生成するマイクロバブルを用いた溶存酸素除去プロセスの構築とガス放散時および吸収時における物質移動特性の解明を行った(第3部)。