Workshop on Geometry and Representation Theory

National University of Singapore
January 26-28, 2011

(Venue: IMS seminar room, http://www2.ims.nus.edu.sg/)

Day 1: January 26, 2011 (Wednesday)

<u>Afternoon Session</u>

2:30-3:30

Speaker: Jae-Hyun Yang (Inha University, Korea)
Title: Invariant differential operators on Siegel-Jacobi space and Maass-Jacobi forms

4:00-5:00

Speaker: Atsushi Ichino (Kyoto University, Japan)
Title: Formal degrees and local theta correspondence

Day 2: January 27, 2011 (Thursday)

<u>Morning Session</u>

10:00-11:00
Speaker: Kyo Nishiyama (Aoyama Gakuin University, Japan)
Title: Multiple flag varieties of finite type for symmetric pairs

11:30-12:30

Speaker: Shu-Yen Pan (National Tsing Hua University, Taiwan)
Title: Supercuspidal representations and preservation principle of local theta correspondence

<u>Afternoon Session</u>

2:30-3:30

Speaker: Eitan Sayag (Ben Gurion University, Israel)
Title: Gelfand pairs, distinction and functoriality

4:00-5:00

Speaker: Wee Teck Gan (UCSD and NUS)
Title: Representations of metaplectic groups

Day 3: January 28, 2011 (Friday)

<u>Morning Session</u>

10:00-11:00

Speaker: Hung Yean Loke (NUS)
Title: On the maximal primitive ideal corresponding to the model nilpotent orbit

11:30-12:30

Speaker: Shunsuke Yamana (Osaka City University, Japan)
Title: Degenerate principal series representations for quaternionic unitary groups

<u>Afternoon Session</u>

2:00-3:00

Speaker: Jia Jun Ma (NUS)
Title: Dual pairs and $U(g)^{\wedge}K$ actions

Contact: Chen-bo Zhu (matzhucb@nus.edu.sg)

Abstract of the talks

_____

1. Invariant differential operators on Siegel-Jacobi space and Maass-Jacobi forms
   (Jae-Hyun Yang)

In this talk I will discuss differential operators on the Siegel-Jacobi space invariant under the natural action of the Jacobi group, and using these invariant differential operators we study Maass-Jacobi forms. The Siegel-Jacobi space is a very important non-reductive homogeneous space in the aspects of arithmetic and geometry. Also I present some examples of explicit invariant differential operators on the Siegel-Jacobi space. In the end of my talk, I will propose several important problems that must be investigated in the future.

2. Formal degrees and local theta correspondence
   (Atsushi Ichino)

The formal degree conjecture relates a certain representation-theoretic invariant to an arithmetic invariant. We test its functoriality property in the case of local theta correspondence. If time permits, we also discuss a relation with the Siegel-Weil formula. This is joint work with Wee Teck Gan.

3. Multiple flag varieties of finite type for symmetric pairs
   (Kyo Nishiyama)

Multiple product of flag varieties sometimes have finitely many orbits under the diagonal action of G. For classical G, there is a classification of Magyar-Weymann-Zelevinski, and recently by Matsuki also. We generalize the notion to the case of symmetric pairs, and give interesting examples and sufficient conditions for finiteness of orbits.

4. Supercuspidal representations and preservation principle of local theta correspondence
   (Shu-Yen Pan)

The preservation principle of local theta correspondence predicts the existence of a chain of irreducible supercuspidal representations of p-adic unitary groups. In this talk we shall give an explicit characterization of the chain starting from a one-dimensional representation of a unitary group of one variable.

5. Gelfand pairs, distinction and functoriality
   (Eitan Sayag)

I will describe a family of disjoint Gelfand pairs, and show that distinction with respect to each member of the family is compatible with functorial base change.

6. Representations of metaplectic groups
   (Wee Teck Gan)

I will describe some recent results in the representation theory of metaplectic groups, which are double covers of symplectic groups. These are contained in my joint work with Gross-Prasad and Savin, as well as some recent work of Wen-wei Li and Dani Szpruch.

7. On the maximal primitive ideal corresponding to the model nilpotent orbit
   (Hung Yean Loke)

Let $\mathfrak{g}_0 = \mathfrak{k}_0 \oplus \mathfrak{s}_0$ be the Cartan involution of a split simple real Lie algebra $\mathfrak{g}_0$. Let $\mathfrak{g} = \mathfrak{g}_0$ -$\mathbb{C}$ and $\mathfrak{k} = \mathfrak{k}_0$ -$\mathbb{C}$. It is well known that among the set of primitive ideals in the universal enveloping algebra $U(\mathfrak{g})$ with infinitesimal character one half of ρ, there is a unique maximal primitive ideal J. Let $Q = U(\mathfrak{g})/J$. In this talk, we show that the subalgebra $Q^{\wedge}k$ isomorphic to $U(\mathfrak{k})^{\wedge}k$. In particular $Q^{\wedge}k$ is commutative. Let K be a compact subgroup with Lie algebra k0. An immediate corollary of the main theorem is that if W is an irreducible ($\mathfrak{g}$, K)-module annihilated by J, then W is K-multiplicity free and, two such irreducible ($\mathfrak{g}$, K)-modules with a common nonzero K-type are isomorphic. This is a joint work with Gordan Savin.

8. Degenerate principal series representations for quaternionic unitary groups
   (Shunsuke Yamana)

I give a complete description of all points of reducibility and the composition series of the degenerate principal series representations for quaternionic unitary groups which are induced from a character of the maximal parabolic subgroup with abelian unipotent radical.

9. Dual pairs and U(g)^K actions
   (Jia Jun Ma)

For a see-saw pair of real reductive groups (G, G') and (H, H'), where H < G and G' < H', there is a joint action of U(g)^H and U(h')^G' on the space Hom_H(Θ (σ), τ). Here σ and τ are a H-module and a G'-module occurring in Howe correspondence for the pair (H,H') and the pair (G,G'), respectively, and Θ (σ) is the Howe quotient of σ. These actions determine each other in a way which is independent of real forms. By using this observation and applying some surjectivity result on invariant differential operators, one can identify some subquotients of derived functor (or "transfer of K-types") modules explicitly, thus providing links between theta lifts of modules from different dual pairs.