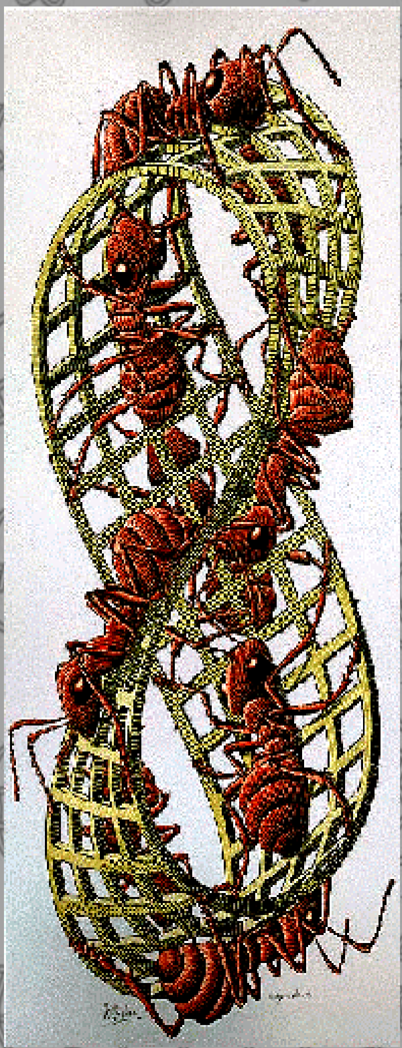
# 2014 Winter TAPU Workshop on Knots and Related Topics



**21(Tue) - 23(Thu) January 2014**

**NS3 219**
**College of Natural Sciences**
**Kyungpook National University**
**Seminar Room 3**
**Yong Pyong Resort**

**Organizers:**
**Yongju Bae (KNU, Chair)**
**Sang Youl Lee (PNU)**

**Sponsors:**
**Institute of Basic Science, KNU**
**BK21+ NCMCD, KNU**
**BK21+ CMRE, PNU**

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# SCHEDULE

**21(Tue) January 2014**

**10:00-11:00** **Chair : Y. Bae**

**Jieon Kim (Pusan National University)**
**Quandle 2-cocycle invariants of surface-links in R^4 via marked graph diagrams**

**Woosik Jeong (Kyungpook National University)**
**On the colorability of theta-curve by the Z_2-family of dihedral quandles**

**Seonmi Choi (Kyungpook National University)**
**On construction of surface braids of non-orientable surfaces**

**11:20-12:00** **Chair : Y.-H. Im**

**Yewon Joung (Pusan National University)**
**A construction of invariants for surface-links via G.Kuperberg's $A_{2}$-bracket**

**Seongjeong Kim (Kyungpook National University)**
**On the quotient quandles of Takasaki quandles**

**12:00-13:30**
**Lunch**

**13:30-14:20** **Chair : C.-Y. Park**

**Myeong-Ju Jeong(KAIST)**
**Delta moves on virtual knots**

**14:30-15:20** **Chair : S. Y. Lee**

**Myoungsoo Seo (Kyungpook National University)**
**On the n-crossing number of knots and links**

**15:40-16:30** **Chair : Y.-H. Im**

**Dongseok Kim (Kyonggi University)**
**The flat plumbing basket number of knots with 7 crossings or less**

**16:40-17:30** **Chair : Y. Bae**

**Sang Youl Lee (Pusan National University)**
**Tripp's conjecture for alternating knots of braid index 3**

**18:00-**
**Dinner and Discussion**

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**22(Wed) January 2014**

**Free Discussion**

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**23(Thu) January 2014**

**10:00-10:50** **Chair : I.S. Lee**

**Sungwon Kwon (Kyungpook National University)**
**On construction of virtual surface links**

**11:00-11:50** **Chair : Y. Bae**

**In Sook Lee (Kyungpook National University)**
**On the arc index of $\theta$-curves**

**14:00-**
**Free Discussion**

# ABSTRACT

**21(Tue) January 2014**

**10:00-11:00** **Chair : Y. Bae**

**Jieon Kim (Pusan National University)**

**Quandle 2-cocycle invariants of surface-links in $R^4$ via marked graph diagrams**

Abstract: In this talk, I'd like to introduce quandle 2-cocycle invariants of surface-links in $\mathbb{R}^4$ obtained by using marked graph diagrams and quandle 2-cocycles. This is a joint work with S. Y. Lee.

**Woosik Jeong (Kyungpook National University)**

**On the colorability of theta-curve by the $Z_2$-family of dihedral quandles**

Abstract: A genus g handlebody-knot is a handlebody of genus g embedded in $R^3$. A handlebody-link is a disjoint union of handlebody-knots in $R^3$. If we regard a circle as a trivalent graph, then a handlebody-link is represented by a spatial trivalent graph. In particular, it is known that a genus two handlebody-knot is represented by a $\theta$-curve. In 2012, Ishii, Iwakiri, Jang and Oshiro introduced the notion of a G-family of quandles. A G-family of quandles induces a quandle, called the associated quandle, which gives a coloring of a spatial trivalent graph. In this talk, we will study the colorability of a $\theta$-curve by using the $Z_2$-family of dihedral quandles $(Z_n,\{*_0,*_1\})$.

**Seonmi Choi (Kyungpook National University)**

**On construction of surface braids of non-orientable surfaces**

Abstract: The braid is one of the most important tools in knot theory. In 2-dimensional knot theory, there are various generalizations of classical braids. Viro introduced the notion of a 2-dimensional braid, which is called a surface braid. However these are mostly defined under the condition of orientable surfaces. We will give a construction of surface braids of non-orientable surfaces. By using this construction, we will expect to develop some theories of surface braids of non-orientable surfaces, similar to the case of orientable surfaces.

**11:20-12:00** **Chair : Y.-H. Im**

**Yewon Joung (Pusan National University)**

**A construction of invariants for surface-links via G.Kuperberg's $A_{2}$-bracket**

Abstract: In this talk, I'd like to introduce an attempt to obtain invariants of surface-links in $\mathbb R^4$ by using marked graph diagrams and G.Kuperberg's variants of the Jones polynomials. This is a joint work with S. Y. Lee.

**Seongjeong Kim (Kyungpook National University)**

**On the quotient quandles of Takasaki quandles**

Abstract: In this talk, we are going to give a quotient structure of Takasaki quandles which comes from its intrinsic algebraic properties. Indeed, we will show that if a subquandle $X$ of a Takasaki quandle $Q$ has a form of a translation of a subgroup of $Q$ as groups, then one can show the set $\{X*g | g \in Q \}$ is a quandle under the operation $(X*g)*’(X*h)=X*(g*h)$. On the other hands, in 2010, Bunch, Lofgren, Rapp and Yetter defined a quotient structure of quandles in terms of inner quandle automorphism groups of quandles. We will show that those two quotient structures give the same quandle for connected Takasaki quandles.

**13:30-14:20** **Chair : C.-Y. Park**

**Myeong-Ju Jeong (KAIST)**

**Delta moves on virtual knots**

Abstract: A delta move is an unknotting operation for classical knots which is equivalent to the $C_2$-move introduced by Habiro. $C_n$-moves were used to analyze finite type invariants of knots and $n$-equivalence of 3-manifolds. Though any knot can be unknotted by a finite sequence of delta moves, it is not true for virtual knots. We give necessary conditions for two virtual knots to be related by delta moves and give a lower bound for the delta moves by using a Vassiliev invariant of degree 2.

**14:30-15:20** **Chair : S. Y. Lee**

**Myoungsoo Seo (Kyungpook National University)**

**On the n-crossing number of knots and links**

Abstract: An n-crossing is a point in a knot or link projection where n strands cross so that each strand bisects the crossing. The n-crossing number of a knot or link L is the least number of crossings in an n-crossing projection of L. Colin Adoms introduced these notions in [Triple crossing number of knots and links JKTR 22, 2013]. In this talk, we will introduce several notions related with n-crossing projections and their properties.

**15:40-16:30** **Chair : Y.-H. Im**

**Dongseok Kim (Kyonggi University)**

**The flat plumbing basket number of knots with 7 crossings or less**

Abstract: A new direction of the classification of links is developing by presenting linksas boundaries of the flat plumbing basket surfaces. The minimal flat plumbing number amongall flat plumbing basket surfaces of a given link $L$ is defined to be the flat plumbing basketnumber of the link $L$. In present talk, we finda classification theorem about the knots of the flat plumbing basket number up to $4$.Using this classification theorem, we find the flat plumbing basket number knots with $7$ crossings or less.

**16:40-17:30** **Chair : Y. Bae**

**Sang Youl Lee (Pusan National University)**

**Tripp's conjecture for alternating knots of braid index 3**

Abstract: A conjecture proposed by J. Tripp in 2002 (later modified by T. Nakamura) states that the crossing number of any alternating knot coincides with the canonical genus of its whitehead double. In the meantime, it has been established that this conjecture is true for a large class of alternating knots including (2, n) torus knots, 2-bridge knots, algebraic alternating knots, and alternating pretzel knots. In this talk, I'd like to introduce recent progress on this conjecture for alternating knots of braid index 3.This is a joint work with H. J. Jang.

**18:00-**
**Dinner and Discussion**

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**22(Wed) January 2014**

**Free Discussion**

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**23(Thu) January 2014**

**10:00-10:50** **Chair : I. Lee**
**Sungwon Kwon (Kyungpook National University)**
**On construction of virtual surface links**

Abstract: A virtual knot is a generalization of the classical knots, which is introduced by Kauffman in 1999. A virtual knot is defined by an equivalence class of virtual knot diagrams under generalized Reidemeister moves. Similarly, we can consider an equivalence of virtual broken surface diagrams that are equivalent under generalized Roseman moves.In this talk, we will introduce a construction of virtual surface links.

**11:00-11:50** **Chair : Y. Bae**
**Insook Lee (Kyungpook National University)**
**On the arc index of θ-curves**

Abstract: An arc presentation P of a knot or a link L is an embedding of L in a finite collection of open half-planes, called pages, with a common boundary line in such a way that each half plane contains a properly embedded single arc. The number of half-planes is called the arc number of the arc presentation, and denoted by $\alpha(P)$. For a given knot or link L, the minimal number of arcs in all arc presentations of L is called the arc index of L, denoted by $\alpha(L)$. A θ-curve θ is a graph embedded in S3, which consists of two vertices (v1,v2) and three edges (e1,e2,e3), such that each edge joins the vertices. In this talk, we introduce the arc index of θ-curves and give an upper bound of arc index of θ -curve.

**14:00-**
**Free Discussion**