NOTETAKER CHECKLIST FORM

(Complete one for each talk.)

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Speaker’s Name: Dylan Thurston

Talk Title: Cluster Algebra and Triangulated Surfaces

Date: 09/06/12 Time: 2:00 am / pm (circle one)

List 6-12 key words for the talk: cluster algebra, triangulation, surface

Please summarize the lecture in 5 or fewer sentences:
This lecture discusses connections between cluster algebras and triangulations of surfaces.

CHECK LIST

(This is NOT optional, we will not pay for incomplete forms)

- Introduce yourself to the speaker prior to the talk. Tell them that you will be the note taker, and that you will need to make copies of their notes and materials, if any.

- Obtain ALL presentation materials from speaker. This can be done before the talk is to begin or after the talk; please make arrangements with the speaker as to when you can do this. You may scan and send materials as a .pdf to yourself using the scanner on the 3rd floor.
  - Computer Presentations: Obtain a copy of their presentation
  - Overhead: Obtain a copy or use the originals and scan them
  - Blackboard: Take blackboard notes in black or blue PEN. We will NOT accept notes in pencil or in colored ink other than black or blue.
  - Handouts: Obtain copies of and scan all handouts

- For each talk, all materials must be saved in a single .pdf and named according to the naming convention on the “Materials Received” check list. To do this, compile all materials for a specific talk into one stack with this completed sheet on top and insert face up into the tray on the top of the scanner. Proceed to scan and email the file to yourself. Do this for the materials from each talk.

- When you have emailed all files to yourself, please save and re-name each file according to the naming convention listed below the talk title on the “Materials Received” check list:
  (YYYY-MM-DD.TIME.SpeakerLastName)

- Email the re-named files to notes@msri.org with the workshop name and your name in the subject line.
Given a surface \( \mathcal{Z} \) given an ideal triangled area of vertices triangles have map

\[
p = \frac{1}{2} \left( x_2 y_1 + x_1 y_2 + x_2 y_2 + x_1 y_1 \right)
\]

\[
\frac{\partial}{\partial x} x = \frac{\partial}{\partial y} y
\]

Start simpler: hyperbolic ideal polygons

(Felix Keating, Shapero, Thurston,)

Cluster algebras

Cluster algebras are in all but finitely many multitude finite

Many good examples of cluster algebras

\[ Z \]

\[ \mathbb{R}^2 \]

\[ \mathbb{R}^2 \equiv \text{space of curves}
\]

\[ \mathbb{R}^2 \equiv \text{space of hyperbolic metrics}
\]

\[ \mathbb{R}^2 \equiv \text{representations of cluster algebras}
\]

\[ \mathbb{R}^2 \equiv \text{ideal triangulations of surfaces}
\]

\[ \mathbb{R}^2 \equiv \text{shear + shear coordinate}
\]

\[ \mathbb{R}^2 \equiv \text{shear + shear coordinate}
\]

\[ \mathbb{R}^2 \equiv \text{ideal triangulation of surfaces}
\]

\[ \mathbb{R}^2 \equiv \text{lambda and theta}
\]
In a decorated quadrilateral, we have the relation:

\[ x(a, y) x(f) = x(a) x(b) x(e) x(f) = x(a) x(b) x(e) x(f) \]

This is called the

How to parameterize:

Ideal quadrilateral:

\[ \text{Ideal Homologous handle with all vertices an RP} \]

Area = \( \frac{1}{2} \text{ \text{length of base}} \times \text{height} \)

Lemmas
Theorem: For any triangulation of a surface with

\[ e \geq 2 \]  

ends and punctures (a maximal collection of disjoint arcs with

\[ \text{max}(g,(a),(c),(b)+(c)) \]  

end points at punctures

Pick a triangulation with vertices

\[ \text{faces} = \text{bottom} \]

least one on each boundary component, at

at least one marked point on each boundary, and at

at least one marked point on the

boundary, with some marked points on the

Marked Surfaces: Surfaces with too small

Study the associated quotient algebra.

We don't actually need any of this algebra.

\[ f(t) = \max(g,(a),(c),(b)+(c)) \]

\[ f(x) = \text{max}(f_a(t),(c),(b)+(c)) \]

Then

Simple curves

1. x = H of instructions 2.

Produce relation, typical variant

Positive points of a geom. Cluster algebra

Self-folded.

Infinite.

By any triangulation (combinatorial).

Every (e.g. sufficiently large) marked surface

(at least 4) geodesics.

\[ \text{faces} \text{ are needed} \]

Any the triangulation of \( S \) are needed.

Create a quiver for the triangulation:

arc, (connects qubits around)

and a region boundary for each boundary

with one vertex for each edge of the triangulation.

\[ x = 4 \]  

\[ 3 + 3 + \text{max}(g,(a),(c),(b)+(c)) \]  

\[ \text{faces} \text{ are needed} \]  

\[ f(x) = \text{max}(f_a(t),(c),(b)+(c)) \]  

Then

Simple curves

1. x = H of instructions 2.

Produce relation, typical variant