

Braid Propagation and Interaction of (framed) 4-Valent Spinnetts

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Perimeter Institute and Univ. of Waterloo, Waterloo ON, Canada

Loops'07

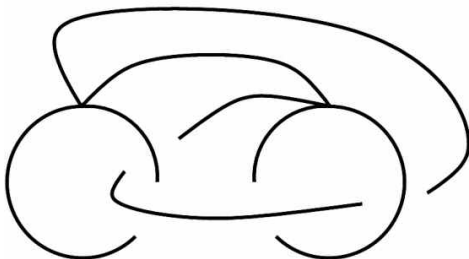
OUTLINE

- 1 Introduction
 - Embedded (framed) 4-valent spin-networks
 - Notation
 - 3-strand braids
- 2 Operations
 - Equivalence Moves
 - Reducibility of Braids
 - Evolution Moves
- 3 Braid Interaction
- 4 Braid Propagation
- 5 Some Discussion on Braid Interaction/Propagation
- 6 Conclusions and Future Works

Embedded (framed) 4-valent spin-networks

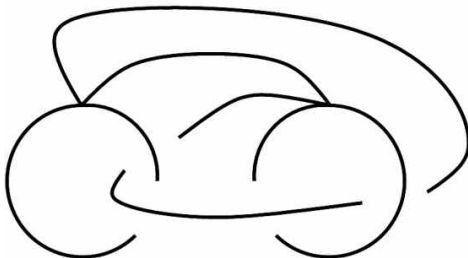
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Embedded (framed) 4-valent spin-networks



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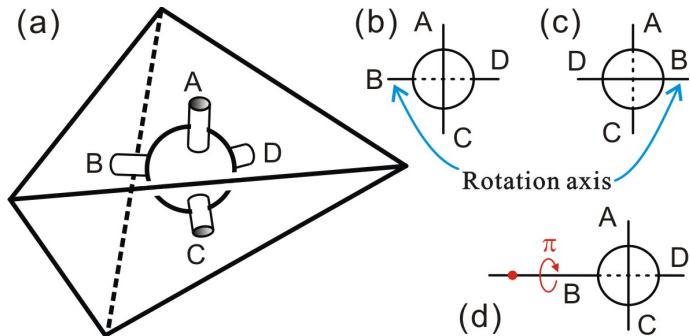
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Notation

Spheres and Tubes

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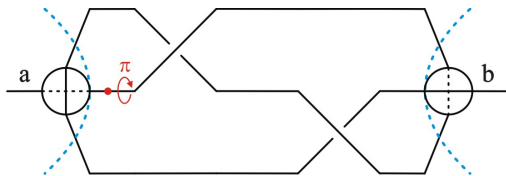


A New-found Land?

An Example Braid

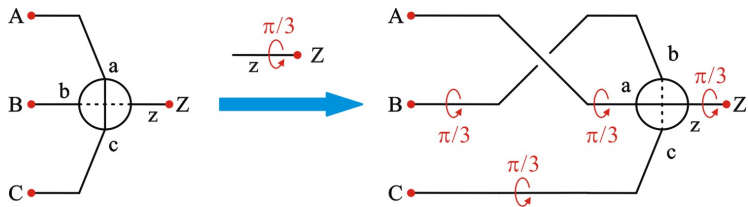
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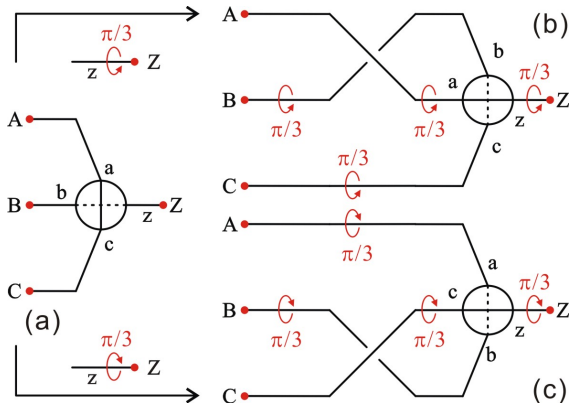


$\frac{\pi}{3}$ -Rotations: generators of rotations

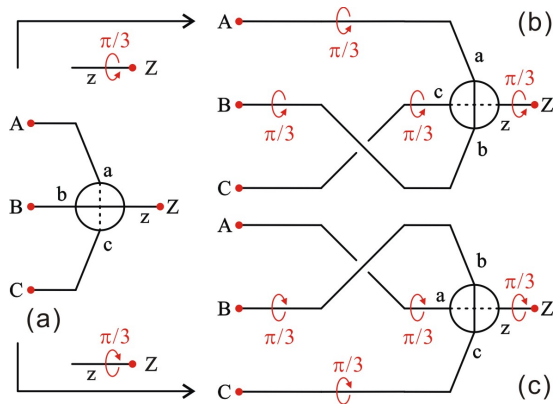
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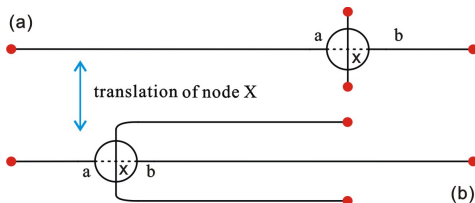
Translations

- Case 1

- Case 2

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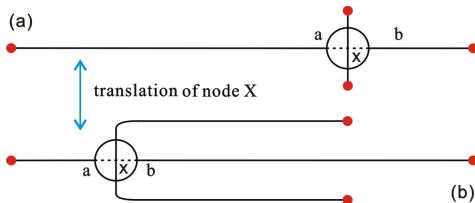
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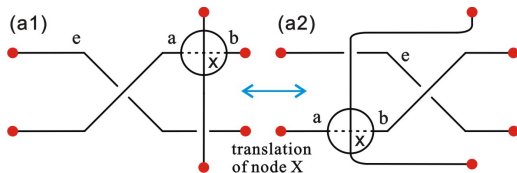
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Translations

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Reducible and Irreducible Braids

Definition

A braid is **(left) right (ir)reducible** if it is equivalent to a braid with fewer crossings by equivalence moves exerted only on its (left) right end-node.

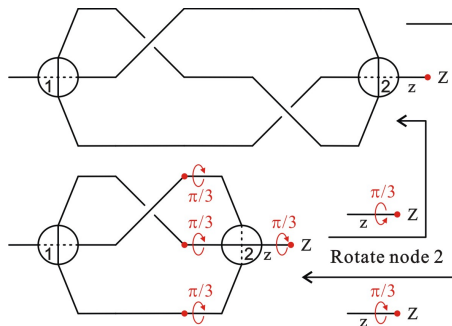
Example

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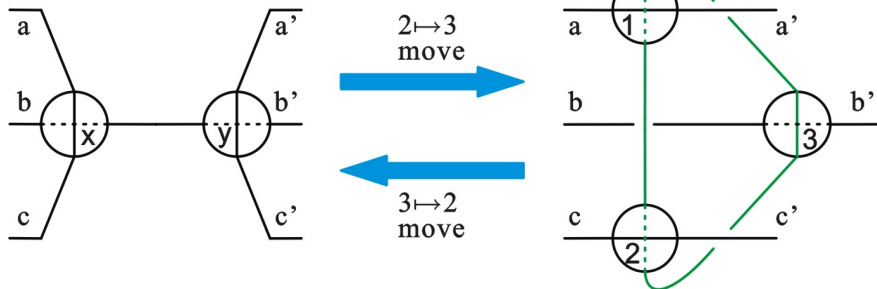
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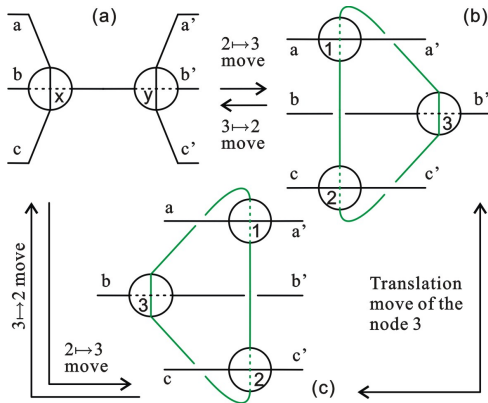


2 \longleftrightarrow 3 Moves

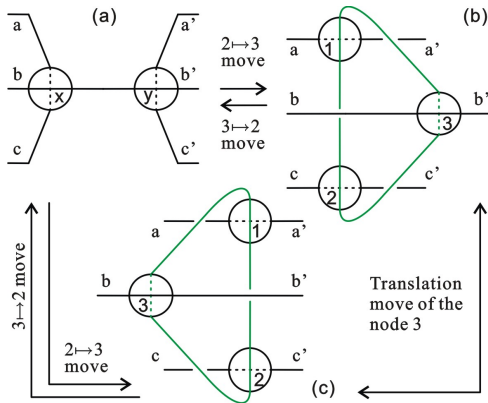
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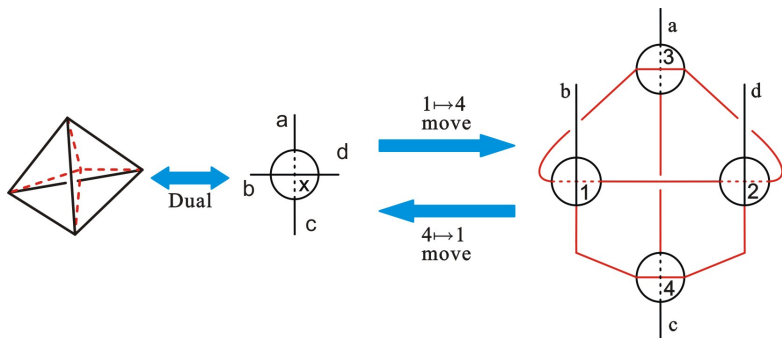


2 \longleftrightarrow 3 Moves



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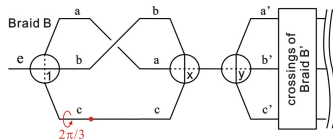
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An Example of **Active Right-Interaction**

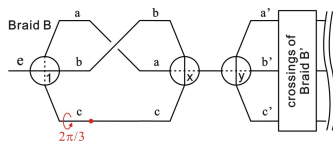
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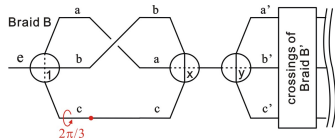
Evolution moves



Equivalence moves

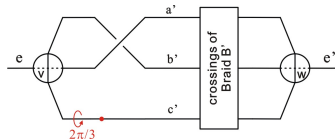
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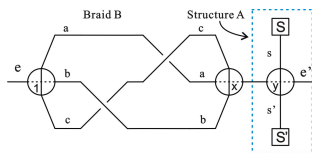


- **!!!Bingo!!! We got a new braid! Plus the conservation of twist!**

An Example of **Right-Propagation**, the unframed case

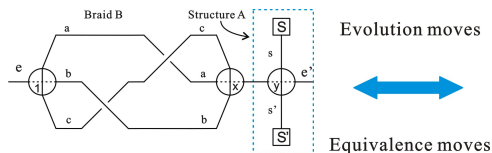
- I hesitate to say, but,  **Bingo** again!!! The braid moves to the right of the structure!

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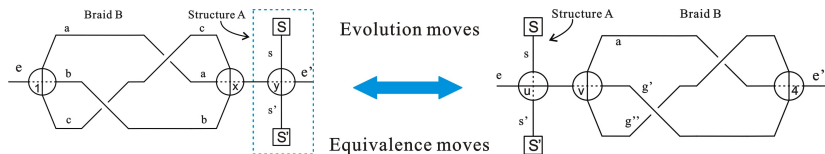
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Some of the Theorems Constraining Braid interaction/propagation

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- *A (left) right-irreducible braid is not **actively (left) right-interacting**.*
- *A irreducible braid is never **actively interacting**.*

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- *A (left) right-irreducible braid is not **(left) right-propagating**.*
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Conclusions

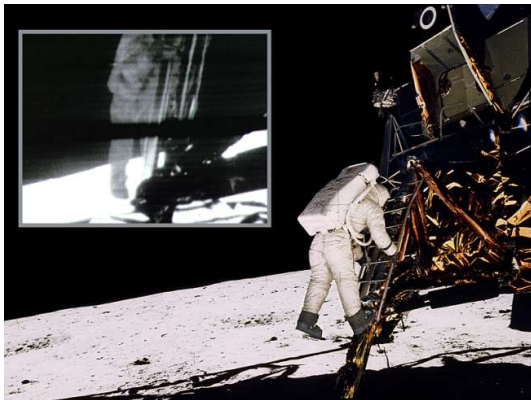
- 1 We studied the 3-strand braid excitations on embedded 4-valent framed spinnets, both framed and unframed cases;
- 2 There are classifications of braids, namely reducible, irreducible braids, and many more.
- 3 There are examples of braids that can propagate
- 4 There are examples of braids that can actively interact
- 5 Both propagations and interactions are chiral.
- 6 Active interaction implies propagation.

Future Works

- 1 Solve the problem of twist-conservation;
- 2 Find correspondence with physics:
 - Would this recover Sundance's Preon Model?
 - Or, would this has a completely new correspondence with particle physics?
- 3 Is there any direct application of these findings?
 - Possible, e.g. Solving the dynamical problem of Ansari's calculation of B.H. spectroscopy (see arXiv:hep-th/0607081).

(DIS)CLAIMER

¿What did Neil Armstrong say when he first time set foot on the moon?

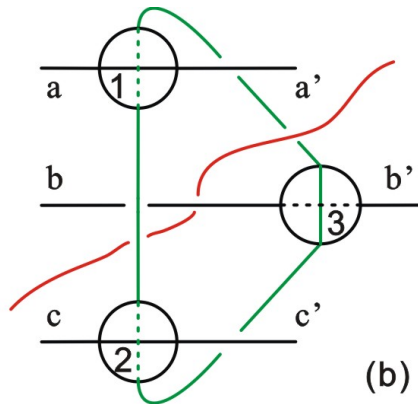
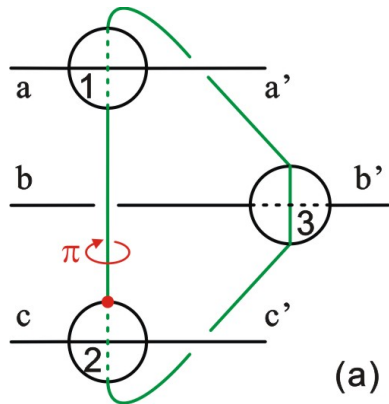


Acknowledgement

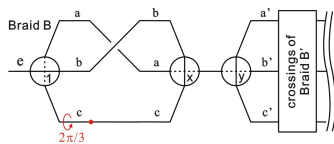
Thanks the organizers of the conference who make this presentation possible! Thanks the Perimeter Institute and the University of Waterloo for funding my attendance to the conference!

Illegal 3 \longrightarrow 2 Move

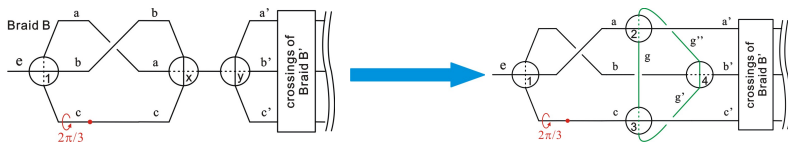
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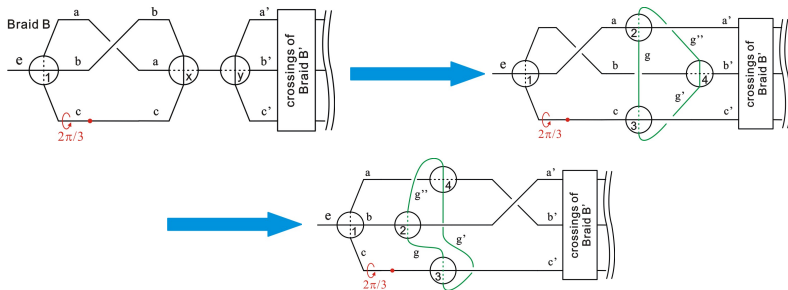
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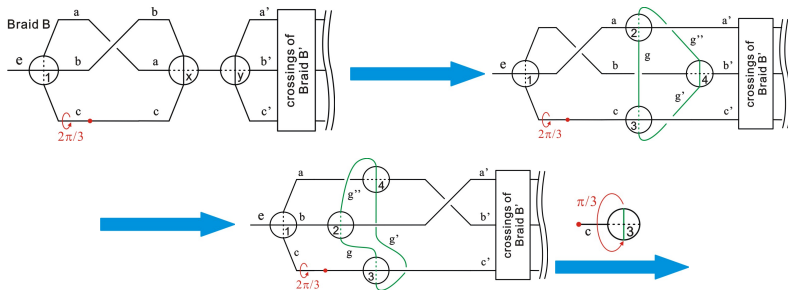
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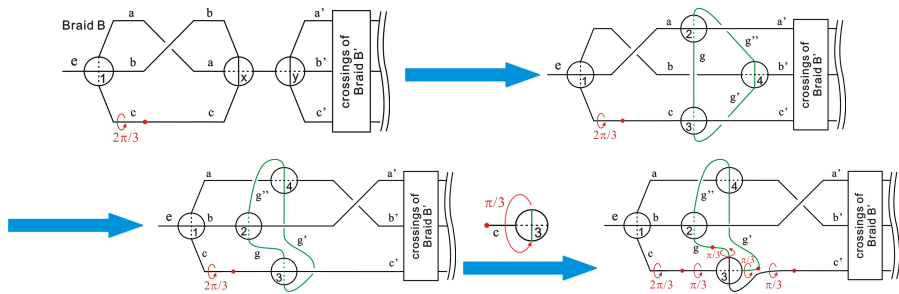
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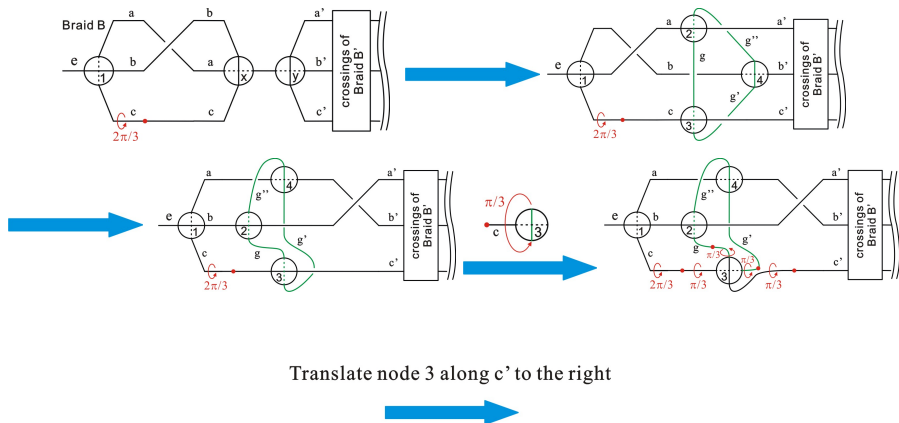
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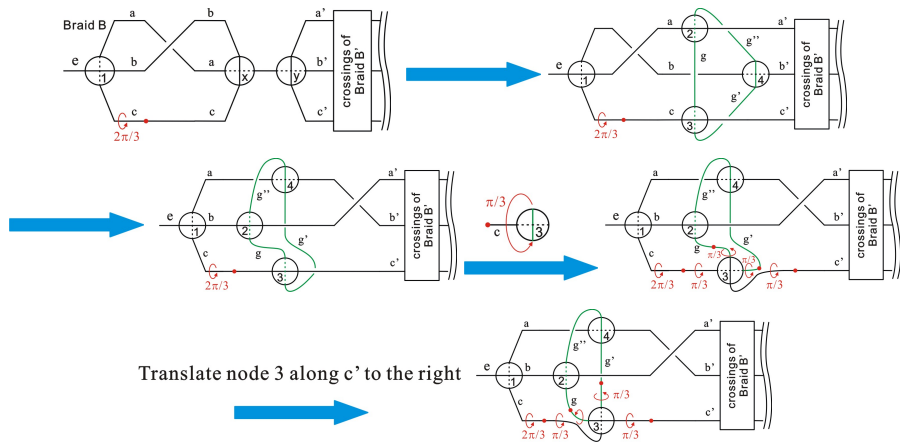
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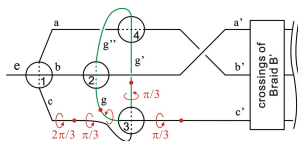
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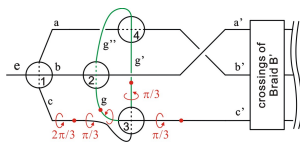
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An Example of Active Right-Interaction: Continued

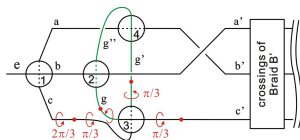


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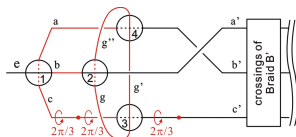


This rotation cancels the twists on g and g'

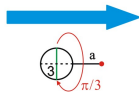
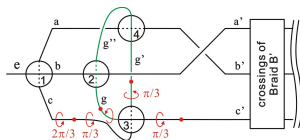
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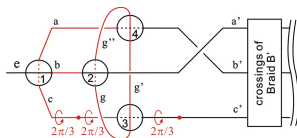
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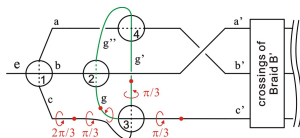


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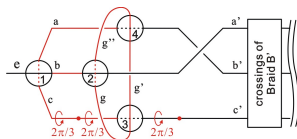


The two twists on edge c, the initial twist and the twist caused by rotations, are exactly cancelled.

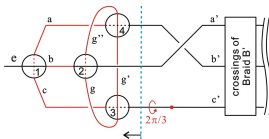
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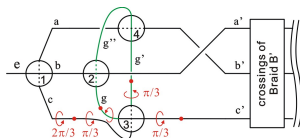
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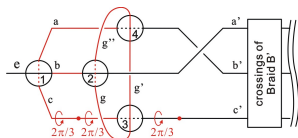
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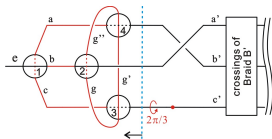
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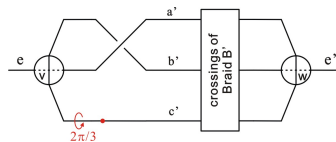
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do $4 \rightarrow 1$ move on whatever on the left of the blue line

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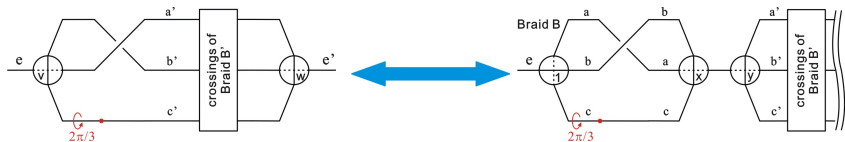
Bingo!!! We got a new braid!



- Plus the conservation of twist

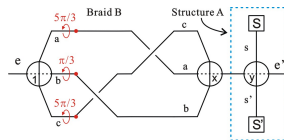
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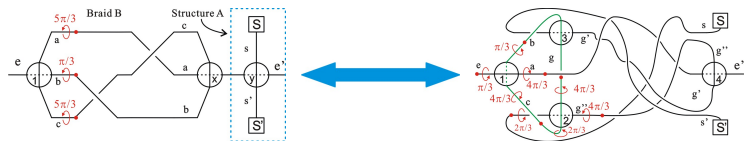
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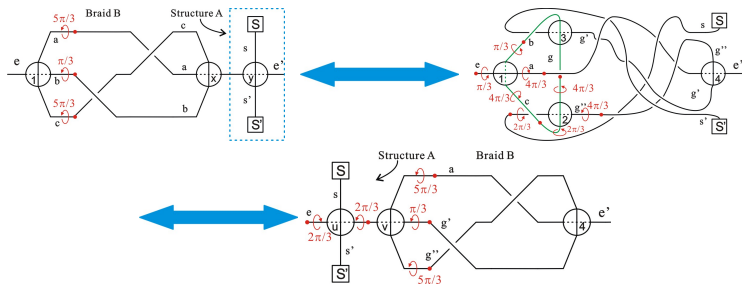
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