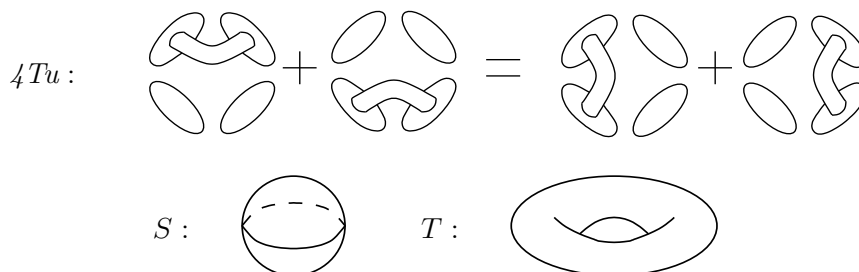


DROR BAR-NATAN



What is it good for?

- (1) Cutting necks:



- (2) Recovers the good old Khovanov theory,

$$\mathcal{F}(\text{crossing}) = \epsilon : \begin{cases} 1 \mapsto v_+ \end{cases} \qquad \mathcal{F}(\text{cup}) = \eta : \begin{cases} v_+ \mapsto 0 \\ v_- \mapsto 1 \end{cases}$$

$$\mathcal{F}(\text{cap}) = \Delta : \begin{cases} v_+ \mapsto v_+ \otimes v_- + v_- \otimes v_+ \\ v_- \mapsto v_- \otimes v_- \end{cases} \qquad \mathcal{F}(\text{circle}) = m : \begin{cases} v_+ \otimes v_- \mapsto v_- & v_+ \otimes v_+ \mapsto v_+ \\ v_- \otimes v_+ \mapsto v_- & v_- \otimes v_- \mapsto 0. \end{cases}$$

- (3) Trivially extends to tangles.
- (4) Well suited to prove invariance for cobordisms.
- (5) Recovers Lee’s theory,

$$\Delta : \begin{cases} v_+ \mapsto v_+ \otimes v_- + v_- \otimes v_+ \\ v_- \mapsto v_- \otimes v_- + v_+ \otimes v_+ \end{cases} \qquad m : \begin{cases} v_+ \otimes v_- \mapsto v_- & v_+ \otimes v_+ \mapsto v_+ \\ v_- \otimes v_+ \mapsto v_- & v_- \otimes v_- \mapsto v_+. \end{cases}$$

- (6) Leads to a new theory (over $\mathbb{Z}/2$ and with $\deg h = -2$),

$$\Delta : \begin{cases} v_+ \mapsto v_+ \otimes v_- + v_- \otimes v_+ + hv_+ \otimes v_+ \\ v_- \mapsto v_- \otimes v_- \end{cases} \qquad m : \begin{cases} v_+ \otimes v_- \mapsto v_- & v_+ \otimes v_+ \mapsto v_+ \\ v_- \otimes v_+ \mapsto v_- & v_- \otimes v_- \mapsto hv_-. \end{cases}$$

- (7) Trivially extends to knots on surfaces.
- (8) Non-trivially recovers Khovanov’s c ,

$$\epsilon : \begin{cases} 1 \mapsto v_+ \end{cases} \qquad \eta : \begin{cases} v_+ \mapsto 0 \\ v_- \mapsto -c \end{cases}$$

$$\Delta : \begin{cases} v_+ \mapsto v_+ \otimes v_- + v_- \otimes v_+ + cv_- \otimes v_- \\ v_- \mapsto v_- \otimes v_- \end{cases} \qquad m : \begin{cases} v_+ \otimes v_- \mapsto v_- & v_+ \otimes v_+ \mapsto v_+ \\ v_- \otimes v_+ \mapsto v_- & v_- \otimes v_- \mapsto 0. \end{cases}$$

(Added June 29, 2004: what appeared to work didn’t quite. The recovery of Khovanov’s c remains open).

“God created the knots, all else in topology is the work of man.”

Leopold Kronecker (modified)

URL: <http://www.math.toronto.edu/~drorbn/papers/Cobordism> (and see the ‘‘GWU’’ handout)

Date: May 30, 2004.