Topics in rigidity theory from the aspect of Assur Graph

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Assur graphs are the building blocks of any mechanism or structure in engineering. In this talk, the advantages of using Assur Graphs in the rigidity theory community will be demonstrated. It will be shown that the footprints of Assur Graphs appear in many topics of rigidity theory. The initial point is with the **Pebble Game** where for any dimension *d*, the directions of the edges in a graph, define the decomposition of the graph into Assur Graphs (Sljoka et al., 2011). As a matter of fact, the *d*-edges directed out of every vertex are the '*d*-dyad' and a cyclic of *d*-dyads constitute an Assur Graph. **Pinned Isostatic graph** can be defined through the correct decomposition into Assur Graphs (Shai et al., 2010). **Rigidity circuits** (generic circuits) in 2*d* are derived from Assur Graphs through the contraction of all the pinned vertices into one vertex and vice versa; that is, grounding any vertex of a rigidity circuit results in an Assur Graph (Servatius et al., 2010a). There is a conjecture related to 3*d* Assur Graphs and 3*d* rigidity circuits (Shai, 2008). In **geometric constraint** systems, it is possible to use the decomposition of the constraint graphs into Assur Graphs for optimization in the case where changes in dimensions of the drawing are needed (Reich and Shai, 2011). In **Tensegrity,** it is possible to construct novel types of Tensegrity Assur structures (Bronfeld, 2010) that can be both rigid and flexible relying on proven properties that exist solely in Assur Graphs (Servatius et al., 2010b). The unique properties of Tensegrity Assur Graphs were employed also to build a simulation for the locomotion of a caterpillar (Omer, 2011). The latter properties in Assur Graphs were employed to derive mechanisms in **symmetric structures** (Schulze, 2010).

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