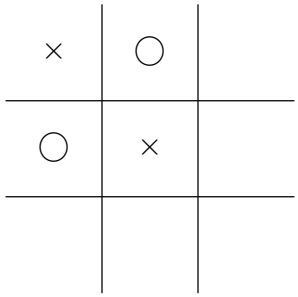
Computer Science P463/P563 **Assignment 6**
Spring, 2009 **Due April 7**

I. *Petri Net Modeling* [20 points]

This exercise will develop a Petri net model for the game of tic-tac-toe, also called X's and O's. A partially played game is shown to the right. It is an illustration of how Petri net models deal with local and global situations.



a. State the conditions associated with one square of the game board. Also state any relations between these conditions – in particular whether they are mutually exclusive or may co-occur.

b. State the conditions that apply to the overall play of the game. Note that conditions need not be binary; thus there should be a single condition `TurnCount` that has n tokens after n turns have been played.

c. Propose a Petri net model for play of the game incorporating the conditions that you stated above. Your model should **not** worry about winning configurations but allow play to continue as long as legal moves are available. Model the details for **only one square** but clearly indicate which parts of your model are to be replicated for the additional squares.

d. It is possible to explicitly model winning configurations but this is combinatorial nightmare. How many transitions would be required to explicitly determine, at the end of play (*i.e.* when `TurnCount` has 9 tokens), whether no player has a winning configuration (three in a row), whether a particular player has won, or whether some anomaly has occurred in play (both players have winning configurations)? As an aside, note that while it is possible to count only transitions that would occur in legal play, including anomalous configurations makes the counting much simpler.

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`http://www.cs.indiana.edu/Academics/integrity.html`.