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Allid Ferrow: Variations on the Art Gallery Theorem

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Sammanfattning

In this thesis, we revisit the classical theory and results concerning art gallery problems. Different versions are presented, where e.g. type of guards, type of polygons, interior/exterior visibility are varied. We begin by showing Chvátal's classical result: $\lfloor n/3 \rfloor$ guards are required, and sometimes necessary, to cover a simple polygon with n vertices. Both the original proof, which is geometric, and Fisk's combinatorial proof are shown. We continue with showing that if we restrict ourselves to orthogonal polygons, then $\lfloor n/4 \rfloor$ guards suffices (and is sometimes necessary). One can choose to cover the exterior of the polygon instead, this is the so-called Fortress Problem. The Prison Yard Problem asks for both an exterior and an interior covering. For both cases we show that $\lceil n/2 \rceil$ guards sufficient and sometimes necessary. What if the guards were more powerful? For example, we consider: edge guards, line guards and triangular guards. The edge guard problem still remains open, but in the other cases $\lfloor n/4 \rfloor$ guards are sufficient and sometimes necessary. We also describe the case when each guard is covered by another guard, to prevent ambush. This is referred to as the Guarded Guard Problem, we show that: $\lfloor \frac{3n-1}{7} \rfloor$ are sufficient, and sometimes necessary in this case.