Dokuz Eylül University
Department of Mathematics

General Seminar

On the Tractability of Un/Satisfiability

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Time: 13.00 - 14.30

Place: Seminar Room B206, Department of Mathematics, Dokuz Eylül University

Absract

This paper attacks the **P** vs **NP** problem by means of one-in-three SAT, also known as exactly-1 3SAT (X3SAT). Clauses C_k, an exactly-1 disjunction $\odot$ of literals, comprise any X3SAT formula, $\phi = \bigwedge C_k$. The assignment $\phi(r_j) := r_j \wedge \phi$ denotes that r_j is true, and reduces by means of $\odot$ any $C_k = (r_j \odot \overline{r}_i \odot r_u)$ in $\phi(r_j)$ into $\psi_k = (r_j \wedge r_i \wedge \overline{r}_u)$ in $\psi(r_j)$. Thus, $\phi(r_j) := r_j \wedge \phi$ is transformed into $\phi(r_j) = \psi(r_j) \wedge \phi'(r_j)$ such that $\psi(r_j) = \bigwedge \psi_k$ and $\phi'(r_j) = \bigwedge C_{k'}$, and that $\psi(r_j)$ and $\phi'(r_j)$ are *disjoint*. If $\not\models \psi(r_j)$, then $\not\models \phi(r_j)$, and r_j is removed from ϕ. Note that it is *trivial* to verify if $\not\models \psi(r_j)$, since $\not\models \psi(r_j)$ iff $\psi(r_j)$ includes some $r_i \wedge \overline{r}_i$, and that $\not\models \psi(r_j)$, sufficient for $\not\models \phi(r_j)$, is *necessary* also, specified in the sequel. $\psi(r_i)$ is true for all r_i, *when* every r_j is removed if $\not\models \psi(r_j)$. Also, $\psi(r_i) \models \psi(r_i|r_j)$. Hence, $\psi(r_i|r_j)$ is true for all r_i in $\phi'(r_j)$, and $\phi'(r_j)$ *is satisfiable.* Thus, any X3SAT formula $\phi(r_i)$ *reduces* to a conjunction of literals $\psi(r_i)$. Therefore, it is *tractable* via $\psi(r_i)$ to verify unsatisfiability of $\phi(r_i)$, hence to verify satisfiability of ϕ. A satisfiable assignment is then constructed; $\psi(r_{i_0}) \wedge \psi(r_{i_1}|r_{i_0}) \wedge \cdots \wedge \psi(r_{i_n}|r_{i_m}) = \phi$. It takes $O(n^3)$. Therefore, $\mathbf{P} = \mathbf{NP}$.