MATEMATISKA INSTITUTIONEN
STOCKHOLMS UNIVERSITET
Avd. Matematik

SJÄLVSTÄNDIGT ARBETE I MATEMATIK

Onsdagen den 13 januari kl. 9:00-10:00 presenterar Freddie Agestam sitt arbete "Interpretations of Classical Logic Using λ-calculus" (15 högskolepoäng, grundnivå).

Handledare: Erik Palmgren

Plats: Sal 32, hus 5, Kräftriket

Sammanfattning: Lambda calculus was introduced in the 1930s as a computation model. It was later shown that the simply typed λ-calculus has a strong connection to intuitionistic logic, via the Curry-Howard correspondence. When the type of a λ-term is seen as a proposition, the term itself corresponds to a proof, or construction, of the object the proposition describes.

In the 1990s, it was discovered that the correspondence can be extended to classical logic, by enriching the λ-calculus with control operators found in some functional programming languages such as Scheme. These control operators operate on abstractions of the evaluation context, so called continuations. These extensions of the λ-calculus allow us to find computational content in non-constructive proofs.

Most studied is the $\lambda\mu$-calculus, which we will focus on, having several interesting properties. Here it is possible to define `catch` and `throw` operators. The type constructors $\wedge$ and $\vee$ are definable from only $\rightarrow$ and $\perp$. Terms in $\lambda\mu$-calculus can be translated to λ-calculus using continuations.

In addition to presenting the main results, we go to depth in understanding control operators and continuations and how they set limitations on the evaluation strategies. We look at the control operator $\mathcal{C}$, as well as `call/cc` from Scheme. We find $\lambda\mu$-calculus and $\mathcal{C}$ equivalents in Racket, a Scheme implementation, and implement the operators $\wedge$ and $\vee$ in Racket. Finally, we find and discuss terms for some classical propositional tautologies.

Alla intresserade är välkomna!