Bivariate semifields: Constructions, Symmetries and Equivalences

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Semifields offer one of the classic constructions of translation planes. Many semifields (Dickson semifields, semifields quadratic over a weak nucleus, . . . ) use a bivariate construction, i.e. they are defined over $\mathbb{F}_{p^m} \cong \mathbb{F}_{p^m} \times \mathbb{F}_{p^m}$ via a semifield multiplication

$$(x, y) \ast (u, v) = (f(x, y, u, v), g(x, y, u, v)).$$

We will focus on specific examples of these bivariate semifields that satisfy additional conditions on $f, g$ that are chosen in a way that the resulting semifield has a lot of symmetries. I shall present both new and old examples of such semifields, as well as ways to determine the complete autotopism groups of some of these semifields. Using these results, we are also able to develop a general framework when such semifields are isotopic or not.

Based on joined work with Faruk Göloğlu [1, 2] as well as some forthcoming work.

References
