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Lindström's Conjecture on a Class of Algebraically Non-Representable Matroids

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A *matroid* is an axiomatization of the idea of linear dependence. The axioms are also satisfied by algebraic dependence. An abstract matroid is called *algebraic* (over a field F) if it is contained in the matroid of algebraic dependence of an extension field of F (this is called a *full algebraic matroid*). Algebraic matroids have been very hard to study. It is known that there exists a matroid M(p) that is algebraic over fields of characteristic p but not other fields. Lindstöm generalized this type of matroid to M(n) for n ≥ 2, but he found that M(n) is not algebraic if n is even. He conjectured that M(n) is not algebraic if n is any composite number.

I introduce a new kind of matroid called a *harmonic matroid*, of which full algebraic matroids are an example. I prove the conjecture in this more general case.