46th Annual Iranian Mathematics Conference
25-28 August 2015
Yazd University

Semi Factorization Structures

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Abstract

In this article the notion of semi factorization structure in a category $\mathcal{X}$ is defined and its properties are investigated. Also conditions under which the semi factorization structure and the factorization structure are equivalent are given.

Keywords: Factorization structure, Semi factorization structure, Category
Mathematics Subject Classification [2010]: 20J99, 18A32

1 Introduction

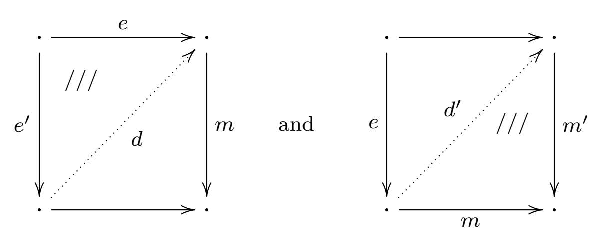
Factorization structures in categories are one of the most studied categorical concepts and weak factorization structures play an important role in homotopy theory(see [2]).

We introduce the notion of semi factorization structure in a category $\mathcal{X}$ and we remark that factorization structures are semi factorization structures. Then we provide an example of a semi factorization structure which is not a factorization structure. Also we analyze some of the properties of semi factorization structures which are similar to those of factorization structures. Finally, we show that if $\mathcal{E}, \mathcal{M}$ are classes of morphisms of $\mathcal{X}$ which are closed under composition and $\mathcal{M} \subseteq Mono(\mathcal{X})$, where $Mono(\mathcal{X})$ is the class of monomorphisms of $\mathcal{X}$, then $\mathcal{X}$ has $(\mathcal{E}, \mathcal{M})$-semi factorization structure if and only if it has $(\mathcal{E}, \mathcal{M})$-factorization structure.

Definition 1.1. Let $\mathcal{E}$ and $\mathcal{M}$ be two classes of morphisms in a category $\mathcal{X}$, which are closed under composition with isomorphisms. We say that $\mathcal{X}$ has semi $(\mathcal{E}, \mathcal{M})$-factorizations or $(\mathcal{E}, \mathcal{M})$ is a semi factorization structure in $\mathcal{X}$, whenever:

(i) for all $f : Y \longrightarrow X$ there exist $m \in \mathcal{M}/X$ and $e \in Y/\mathcal{E}$ such that $f = me$; and

(ii) in the unbroken commutative diagrams below, with $e, e' \in \mathcal{E}$ and $m, m' \in \mathcal{M}$:



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