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*Topologies on the prime spectrum of a ring defined using ultrafilters.* Preliminary report.

Let  $R$  be a ring and let  $\text{Spec}(R)$  be the collection of all prime ideals of  $R$ . For any ideal  $I$  of  $R$  we let  $V(I)$  denote the set of all prime ideals of  $R$  which contain  $I$ . The collection of all sets  $V(I)$  constitutes the closed sets of a topology on  $\text{Spec}(R)$  known as the Zariski topology. There is a well known refinement of the Zariski topology known classically as either the constructable or patch topology. In 2008 Fontana and Loper gave an alternate formulation of the constructable/patch topology using ultrafilters. In this talk we give this ultrafilter definition and discriminate between two different types of ultrafilter limit points. This distinction gives rise to two new topologies on  $\text{Spec}(R)$  defined using ultrafilters. We call these topologies the Goldman topology (defined earlier by Picavet -without use of ultrafilters) and the strong topology. We consider questions such as when these new topologies are compact, when they are discrete and when they are identical to the constructable topology. As an application, we use these new topologies to give a characterization of when a subset of  $\text{Spec}(R)$  is compact in the Zariski topology and we give a simple characterization of Grothendieck's retrocompact sets in the Zariski topology in terms of ultrafilters. (Received January 24, 2011)