Structure of edges of embedded graphs with minimum degree 2

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(joint work with Mária Maceková and Roman Soták)

Let $G = (V, E)$ be a graph. The weight $w(e)$ of an edge $e \in E(G)$ is the sum of the degrees of its endvertices. Kotzig proved that every 3-connected plane graph contains an edge with $w(e) \leq 13$. Borodin extended this result to normal plane maps and Jendroľ described the exact types of edges in such graphs. If we decrease the value of $\delta(G)$ to 2, then graph G does not necessarily contain an edge with bounded weight. However, if we consider additional condition on the girth $g(G)$ of the graph (the length of a shortest cycle in G), then G will contain an edge of weight at most 7 for $g(G) \geq 5$. Jendroľ and Maceková described exact types of edges in plane graphs with $\delta(G) \geq 2$ and $g(G) \geq 5$. Ivančo described bounds for weights of edges in the class of graphs embeddable on the surfaces with higher genus. Later Jendroľ, Tuhársky, and Voss described exact types of edges in large maps on surfaces with $\delta(G) \geq 3$. In this talk we describe exact types of edges in connected toroidal graphs with minimum degree 2 and girth at least 4.