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The Algorithm to Solve the Extend General Malfatti's Problem in a Convex Circular Triangle

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Abstract : The Malfatti's Problem solves the problem of fitting 3 circles into a right triangle such that these 3 circles are tangent to each other, and each circle is also tangent to a pair of the triangle's sides. This problem has been extended to any triangle (called general Malfatti's Problem). Furthermore, the problem has been extended to have 1+2+...+n circles inside the triangle with special tangency properties among circles and triangle sides; we call it extended general Malfatti's problem. In the extended general Malfatti's problem, call it Tri(Tn), where Tn is the triangle number, there are closed-form solutions for Tri(T_1) (inscribed circle) problem and Tri(T_2) (3 Malfatti's circles) problem. These problems become more complex when n is greater than 2. In solving Tri(Tn) problem, n>2, algorithms have been proposed to solve these problems numerically. With a similar idea, this paper proposed an algorithm to find the radii of circles with the same tangency properties. Instead of the boundary of the triangle being a straight line, we use a convex circular arc as the boundary and try to find Tn circles inside this convex circular triangle with the same tangency properties among circles and boundary Carc. We call these problems the Carc(Tn) problems. The CPU time it takes for Carc(T16) problem, which finds 136 circles inside a convex circular triangle with specified tangency properties, is less than one second.

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