Facility Location Problems and Non-Leibniz Analysis on Complex Plane

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The derivative of the function is one of the most fundamental concepts in calculus; however there are a lot of functions, which cannot be differentiated in all points. As a result, mathematicians created the analogue of the derivative for such functions. One of such generalizations is the subdifferential for convex functions, which has a lot of applications in modern mathematics. Also, there are a lot of generalizations of subdifferential for non-convex functions (Clark`s subdifferential, Frechet subdifferential and others). Most of them suit only for real-valued functions. I proposed the concept of the subdifferential for complex-valued functions – “C-subdifferential”. Basic differentiation rules (similar to ones for regular derivative) were outlined: sum, product, quotient and chain rules. Additionally 2 theorems were created about continuity and conditions of an extremum, and another 2 regarding the generalization of Lagrange’s theorem for suggested “C-subdifferential”. These are very important as they are applied in such areas like the problem of the grasshopper or the motion of the satellite. Suggested concept can be used in solving different problems: motion on a complex plane, watershed problem, jumping over an obstacle (conjugate complex number), approximate calculations (Lagrange theorem), Steiner Minimal Trees Problem, facility location problems etc.

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