Hole Filling Answers / Tal Hazi

1. *If there are m boundary pixels and n pixels inside the hole, what's the complexity of the algorithm that fills the hole, assuming that the hole and boundary were already found? Try to also express the complexity only in terms of n.*
   For each hole pixel, calculating its color according to m boundary pixels.
   So the complexity for the algorithm is $O(m \cdot n)$.
   The number of boundary pixels is bounded above, in the worst case, where the hole is a diagonal line and in case of 8-connectivity, by $4n + 4 = O(n)$.
   → Then in terms of n, the complexity is $O(n^2)$.

2. *Describe an algorithm that approximates the result in $O(n)$ to a high degree of accuracy. As a bonus, implement the suggested algorithm in your library in addition to the algorithm described above.*
   The algorithm is based on not using all the boundary pixels per hole pixel.
   To calculate $I(u)$, where $u \in H$, I use the same formula suggested in the task, but ignore all the $v \in B$ in which $\|u - v\| \geq k$, where k is the minimum distance from, which the effect of the Euclidean distance between the pixels on the pixel hole color is negligible (I assumed that there is such a const k).
   Of course, the larger the k - the better the accuracy.
   So there is $O(k)$ boundary pixels for each hole pixel and k is our constant of accuracy, then the complexity is $O(k \cdot n) = O(n)$.
   The function implementing this is called *Algo_Formula.calcColorConstComplex()* (should update the calc function of *Hole_Handler.fillHole()* as well).

3. *Bonus (hard!): Describe and implement an algorithm that finds the exact solution in $O(n\log n)$. In this section, feel free to use any algorithmic functionality provided by external libraries as needed.*
   Although I was able to think of an idea by myself, I do not submit the answer to this question - because I posted it on Facebook with the naive intention of cracking the algorithm. I realized that it was a big mistake of mine and I'm very sorry about that. Hope you will find this understandable, and you will be able to see my technical skills.