

**Errata for “Quantum Walks and Search Algorithms”  
by Renato Portugal, Springer 2013**

January 28, 2015

## Chapter 5

1. Section 5.1.4 Other Coins. Exercise 5.7. Page 75: Equation

$$|\tilde{\Psi}_k(t)\rangle = \tilde{C}_k |\tilde{\Psi}_k(0)\rangle$$

must be replaced by

$$|\tilde{\Psi}_k(t)\rangle = (\tilde{C}_k)^t |\tilde{\Psi}_k(0)\rangle.$$

It is missing power  $t$ . (Pointed out by Tharso Dominisini Fernandes)

## Chapter 6

1. Section 6.3.2: Equations (6.94) and (6.95) are correct in general only if  $\{|\phi_{a,\vec{k}}\rangle\}$  is an orthonormal basis. In the previous Section, we have described a non-orthonormal basis with the same notation. Fortunately, we have used Equation (6.94) only in the subspace associated with eigenvalues  $\pm 1$ , which is spanned by orthonormal vectors. Equations (6.96) to (9.103) are correct. (Pointed out by Yangyi Hu)

## Chapter 8

1. Section 8.2 Analysis of the Evolution. Page 152, line 3: Add at the end of item 1 “Any other eigenvector with eigenvalue 1 must be orthogonal to  $|D\rangle|v_0\rangle$ ”.
2. Section 8.3 Finite Two-Dimensional Lattice. Page 158: There are missing terms in Equation (8.48)

## Chapter 9

1. Section 9.1 Classical Hitting Time. Page 166: The identity in the line before Equation (9.2) should be

$$\sum_{t=0}^{\infty} t \alpha^t = \frac{\alpha}{(1-\alpha)^2}.$$

It is missing  $\alpha$  in the denominator. (Pointed out by Tharso Dominisini Fernandes)

2. Section 9.1.1 Hitting Time using the Stationary Distribution. Exercise 9.3: The minus sign in Equation

$$M^{-1} = \sum_{t=0}^{\infty} P^t - \mathbf{1} \cdot \pi^T$$

must be replaced by plus sign. The correct expression is

$$M^{-1} = \mathbf{1} \cdot \pi^T + \sum_{t=0}^{\infty} P^t.$$

(Pointed out by Tharso Dominisini Fernandes)

3. Further Reading. Page 192: Ref. [46] claims that the finding problem can be solved with a quadratic speedup even removing restrictions (1) state transitivity, (2) only one marked vertex. There is a gap in the proof in this case and there might exist counterexamples. (Information provided by Maris Ozols)