Predicting the exact location of the photon particle on the Riemann surface

Shayan Karami

September 15, 2022

Contents

Introduction

Quantum mechanics is one of the best theoretical and experimental success in the history of science, and it is the most successful theory for explaining the nature. One of the main differences of this theory with other theories before it is this theory is completely based on a mathematics which is created from the results of the experiments, and don't have a strange philosophical background, and it is one of the main reasons which this theory seems very strange for scientists. One of the main examples is the role of probability it this theory, and opposite of classical mechanics we can not predict the feature action, and location with high accuracy; Instead in the wave theory we use the idea of superposition, which we assume all of the possible possibilities until we observe. The travel of one photon particle is in a superposition state, which we know at which area, the possibility is higher, or lower, but we don't have a clear guess. The beginning of this idea and the wave mechanics is from the Young experiment[4] which we found wave behavior from photon particle, and also beam behavior if we observe the photon particle. In this article we trying to remove the idea of the superposition, and probabilistic behaviour of the photon particle, by think the photon particle as one field, which is moving and cutting to sub parts on a Riemann surface, where by calculating the movement of the field on this surface, we can predict the exact location of the photon particle. This theory is only a example of making a probabilistic system to a computable sequence of relations, and not a theory on the true movement of photon particle.

1.1 The superposition of the travel area of the photon particle

Let we have a three dimensional plane, where it is the all possible routes of the photon, we call it as the probability plane. We have a point on this plane call L, where it is an area around the point which the photon's route start from, the possibility that the routes of the wave is in this area is higher, compare to other points, but even for points which are much far from the area L, the possibility is not zero. We can show the possibilities of the plane for each point by the following point,

$$\sum_{x=0}^{r}\sum_{y=0}^{r}\sum_{w=0}^{r}\frac{1}{\gcd(L,[x,y,z])+\epsilon} \tag{1.1}$$

Where r is the area of the probability plane, and ϵ, is a very small number which we use it to show that the prediction of the possibilities for each point is not very accurate.

1.2 Definition of the hypothesis

We assume the photon particle as a field where this field has a known area, and this field is moving by a specific relation on a Riemann surface. We can imagine this Riemann surface as a series of connected branches, which each branch is a part of a sphere, and at a point which we call it the transfer point, one branch connects to another branch. When the field is moving on this surface, and a part of it is moving on the transfer point, that area of the field get cut, and shift to the other branch, and moving on that branch. So we can imagine this as a system where the field cutting to pieces, on a relation of branches, and the points where the area of the sub-fields is closer to the starting field, is the location of the photon. By this we can change the probabilistic relation, to a computable system, where is based on entropy.

Photon's field's structure geometry and its movement on the surface

2.1 Photon's field definition

In this paper we call an area of the surface with exact boundaries which are get by a number of lines which we call theme as know lines, a field. By using field, we can assume the photon as a area, which can be defined by known lines, and then its area is calculated by the method which will get clear in this chapter.

2.2 Known lines of the field

Known lines of the field are a list of lines which we know its exact location on the surface. By this we can use the location of the line, and the points which create this line, to create the area of the field, and also explain the movement of the filed. We name the known lines list as KLL, which is as following:

$$KLL = (\begin{bmatrix} a_1 \\ b_1 \end{bmatrix} - \begin{bmatrix} A_1 \\ B_1 \end{bmatrix}), (\begin{bmatrix} a_2 \\ b_2 \end{bmatrix} - \begin{bmatrix} A_2 \\ B_2 \end{bmatrix}), (\begin{bmatrix} a_3 \\ b_3 \end{bmatrix} - \begin{bmatrix} A_3 \\ B_3 \end{bmatrix}), ... \tag{2.1}$$

By this we can understand that we can define the known lines as any angle and size by the matrix, so we can not calculate the area of the field by the connected known lines; So instead of that we use another approach which I call it as connecting points geometry.

2.3 Connecting points geometry

Let we have two known line as K_1, and K_2, where

$$K_1 = (\begin{bmatrix} a_1 \\ b_1 \end{bmatrix} - \begin{bmatrix} A_1 \\ B_1 \end{bmatrix}) = \begin{bmatrix} aA_1 \\ bB_1, \end{bmatrix} \tag{2.2}$$

and,

$$K_2 = (\begin{bmatrix} a_2 \\ b_2 \end{bmatrix} - \begin{bmatrix} A_2 \\ B_2 \end{bmatrix}) = \begin{bmatrix} aA_2 \\ bB_2 \end{bmatrix}. \tag{2.3}$$

The connecting points geometry is a method which I create that we connect each point of the known lines to each other, which creates a vector line;By the fact that we have infinite number of points on each known lines, that connection of lines makes a two dimensional area, which that area is the area of the field. For doing that we make a term as M, which gives the number of the point to the function and its doing it until n, but it is not a addition function, by this we create the lines by connecting the points.

$$\underset{\mathbf{t=1}}{M}\ \underset{\mathbf{f=1}}{M} \begin{bmatrix} aA_{1_t} \\ bB_{1_t} \end{bmatrix} - \begin{bmatrix} aA_{2_f} \\ bB_{2_f} \end{bmatrix} \tag{2.4}$$

$$\underset{\mathbf{t,f\,=\,1\ and\ t\,>,\,f}}{M} \begin{bmatrix} aA_{1_t} \\ bB_{1_t} \end{bmatrix} - \begin{bmatrix} aA_{2_f} \\ bB_{2_f} \end{bmatrix} \tag{2.5}$$

The operation $t>, f$ means until the number t is greater the f, then f changes.

This equation is very helpful because we are able to make changes to the area by just changing this equation; For example the known line K_2 moves by $\begin{bmatrix} -3 \\ 4 \end{bmatrix}$, then the area equation will be the following,

$$\underset{\mathbf{t,f\,=\,1\ and\ t\,>,\,f}}{M} \begin{bmatrix} aA_{1_t} \\ bB_{1_t} \end{bmatrix} - (\begin{bmatrix} aA_{2_f} \\ bB_{2_f} \end{bmatrix} + \begin{bmatrix} -3 \\ 4 \end{bmatrix}) \tag{2.6}$$

2.4 connecting two fields to each other

For showing the behaviour of the light photon we can use two fields which are connected to each other by one known line.The reason of doing it is to show the possibility of different energy states of the photon, but with only one unit, and also we can make the movement on the surface more advance. Let we have two fields KLL_1 and KLL_2. And both fields has N known lines, and each known line has K points. The relation of the lines to each other is have to be a smooth relation, to be able to show the behaviour of the photon; So for the known lines we make the distance of the top point of the line $\frac{1}{r}$, and for button point is $\frac{1}{r+sqrtr}$, where r is from 1 to n; The result of this infinite sum will be one at the end, which means we will get a perfect circle for the known lines.

$$KLL = \sum_{r=1}^{n} \begin{bmatrix} a + \frac{1}{r} \\ b + \frac{1}{r} \end{bmatrix} - (\begin{bmatrix} A + \frac{1}{r+\sqrt{r}} \\ B + \frac{1}{r+\sqrt{r}} \end{bmatrix} \tag{2.7}$$

$$KLL = \sum_{r=1}^{n} \begin{bmatrix} \frac{ar+1}{r} \\ \frac{br+1}{r} \end{bmatrix} - (\begin{bmatrix} \frac{Ar+A\sqrt{r}+1}{r+\sqrt{r}} \\ \frac{Br+B\sqrt{r}+1}{r+\sqrt{r}} \end{bmatrix} \tag{2.8}$$

$$KLL = \sum_{r=1}^{n} \begin{bmatrix} \frac{ar+a\sqrt{r}+\frac{\sqrt{r}}{r}-Ar+A\sqrt{r}+2}{r+\sqrt{r}} \\ \frac{br+b\sqrt{r}+\frac{\sqrt{r}}{r}-Br+B\sqrt{r}+2}{r+\sqrt{r}} \end{bmatrix} \tag{2.9}$$

Then we can use this relations in the connecting lines function:

$$\sum_{r=1}^{n} \underset{\mathbf{t,f\,=\,1\ and\ t\,>,\,f}}{M} \begin{bmatrix} (\frac{ar^2+r+ar\sqrt{r}-Ar^2+Ar\sqrt{r}+r}{r^2+r\sqrt{r}})_{tf} \\ (\frac{br^2+r+br\sqrt{r}-Br^2+Br\sqrt{r}+r}{r^2+r\sqrt{r}})_{tf} \end{bmatrix} \tag{2.10}$$

The connection of two filed is by assume one known line in both fields as one, and then we will have one connection line which is started from one known line of field A, to one known line in filed B. This relation is the following equation, where $\|$ is showing the factor of connection of this two connection lines to each other, and we can see the final known line in first connection line is equal to the starting known line in the second connection line.

$$\begin{bmatrix} a_1 \\ b_1 \end{bmatrix} \Longrightarrow \begin{bmatrix} a_2 \\ b_2 \end{bmatrix} \| \begin{bmatrix} a_3 \\ b_3 \end{bmatrix} \Longrightarrow \begin{bmatrix} a_4 \\ b_4 \end{bmatrix} \tag{2.11}$$

When we make this relation we get a connection line which we call it alpha, which is started from $\begin{bmatrix} a_1 \\ b_1 \end{bmatrix}$ and ends $\begin{bmatrix} a_3 \\ b_3 \end{bmatrix}$.

$$\alpha = \begin{bmatrix} a_1 \\ b_1 \end{bmatrix} \Longrightarrow \begin{bmatrix} a_3 \\ b_3 \end{bmatrix} \tag{2.12}$$

This by this function we can connect one line of field1 to one line of field2, the relation of this shift is based on the equation of the alpha line. The shift from one known line can be only +1 or -1 known line, for calculating that we use the answer of the alpha line. The answer will be a matrix, $\begin{bmatrix} a \\ b \end{bmatrix}$. This matrix can also be shown as $\begin{bmatrix} ka \\ lb \end{bmatrix}$ where k, and l are could be 1 or -1 only. Then we make the matrix $\begin{bmatrix} k \\ l \end{bmatrix}$ a fraction $\frac{k}{l}$, by this we calculate the shift. The movement of two fields has one more step which is when we get the alpha number we will move that line one block, then make the shift, one block forward by the location of the alpha number and the shift is the movement of the field.

Defining the field on the Riemann surface

3.1 Defining the function

We want to show the relation of the field on a Riemann surface, so we chose a function which has a smooth carveture, and we can consider the values of x $\Rightarrow$ r, which is the range, as a smooth surface. Let

$$f(z) = ln(1 - z^2) \tag{3.1}$$

,and

$$g(z) = 1 - z^2 \tag{3.2}$$

, the f(z) is the function of the surface, and we can define the range of the transferring surface, by defining f(z) function range. By the Riemann surface, we can define sheets of the surface, where one sheet connects to next sheet, and by this the Riemann surface is created. Let $x = \begin{bmatrix} a \\ b \end{bmatrix}$, then we defining the each sheet's starting, and ending. Let the number of sheet as t=3, then for sheet 1 is

$$f(\begin{bmatrix} a \\ b \end{bmatrix} + i0) \in \Re, x \Rightarrow 0 \tag{3.3}$$

,

$$f(\begin{bmatrix} a \\ b \end{bmatrix} - i0) = ln(1 - \begin{bmatrix} a^2 \\ b^2 \end{bmatrix}) + 2\pi i \tag{3.4}$$

For sheet 2,

$$f(\begin{bmatrix} a \\ b \end{bmatrix} + i0) = ln(1 - \begin{bmatrix} a^2 \\ b^2 \end{bmatrix}) + 2\pi i \tag{3.5}$$

,

$$f(\begin{bmatrix} a \\ b \end{bmatrix} - i0) = ln(1 - \begin{bmatrix} a^2 \\ b^2 \end{bmatrix}) + 4\pi i \tag{3.6}$$

And the last one,

$$f(\begin{bmatrix} a \\ b \end{bmatrix} + i0) = ln(1 - \begin{bmatrix} a^2 \\ b^2 \end{bmatrix}) + 4\pi i \tag{3.7}$$

We don't have the end point for the sheet 3, because by this we can repeat the cycle over and over.

3.2 Cycling moving on the Riemann surface

Movement of points on the Riemann surface is not limited to simple two dimensional surface, one of the most important examples is the cycling from one sheet to another sheet, and come back to the starting point. Let

$$ln(1 - \begin{bmatrix} a^2 \\ b^2 \end{bmatrix}) \in \Re, x \in (-1, 1) \tag{3.8}$$

By this we defining the range of this function a -1 to 1 range, then we have to define the rounding of the path, which is the following,

$$\delta argg(z) = 2\pi \tag{3.9}$$

, this is the rounding of the path on the top sheet, abd the rounding of the path on the button sheet is the following,

$$\delta argg(z) = -2\pi \tag{3.10}$$

Then we take the integral of the path,

$$I = \oint f(x)\, dz \tag{3.11}$$

By the range we defined and the rounding of the path, we can say the following,

$$I = \int_{1}^{-1} ln(1 - \begin{bmatrix} a^2 \\ b^2 \end{bmatrix})\, dx + \int_{-1}^{1} [ln(1 - \begin{bmatrix} a^2 \\ b^2 \end{bmatrix}) + 2\pi i]\, dx \tag{3.12}$$

The two $ln(1 - \begin{bmatrix} a^2 \\ b^2 \end{bmatrix})$ cancel each other, then the answer of it will be $4\pi i$.

3.3 cutting the field

The method which we have in this paper for calculating the area of the field, is based on the known lines, and known lines are defined by starting point. Then we can say that based on the moving method, the points are moving on this Riemann surface, then we have a list of the location of points. Then the cutting is when one point is moved from one sheet to another sheet, we calculate that point, or better say know line, as the member of the sub-field on that sheet. Know we can write our function for calculating the area of the field as the function of area of the field on the given function.

$$\underset{\mathbf{t,f = 1\ and\ t >,\ f}}{M}(ln(1 - \begin{bmatrix} a^2 \\ b^2 \end{bmatrix} + k2\pi i) = \begin{bmatrix} (\frac{ar+1}{r})_t \\ (\frac{br+1}{r})_t \end{bmatrix} - \begin{bmatrix} (\frac{Ar+A\sqrt{r}+1}{r+\sqrt{r}})_f \\ (\frac{Br+B\sqrt{r}+1}{r+\sqrt{r}})_f \end{bmatrix} \tag{3.13}$$

Where r is the term for each point, and it is increasing and decreasing by the movement of point of the sheet. And k is based on the sheet, and the location of the point, where the range of the sheets have been defined.

Bibliography

[1] Miranda, R., 1995. Algebraic curves and Riemann surfaces. [Luogo di pubblicazione non identificato]: Providence, R.I.

[2] Jost, J. and Simha, R., 1997. Compact Riemann surfaces. Berlin: Springer.

[3] NATANZON, S., 2021. COMPLEX ANALYSIS, RIEMANN SURFACES AND INTEGRABLE SYSTEMS. [S.l.]: SPRINGER.

[4] Andrés, P., 1985. Young's experiment with polarized light: Properties and applications. [S.l.]: American Journal of Physics.