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(* Michel Fodje's Minkwe simulation
 translated from Python to Mathematica by John Reed
 13 Nov 2013 *)

(* Set run time parameters, initialize arrays *)

spin = 1 / 2;
phase = 2 π spin;
spin2 = 2 spin;
trials = 800 000;

aliceDeg = ConstantArray[0, trials];
bobDeg = ConstantArray[0, trials];
aliceDet = ConstantArray[0, trials];
bobDet = ConstantArray[0, trials];


nPP = ConstantArray[0, 361];
nNN = ConstantArray[0, 361];
nPN = ConstantArray[0, 361];
nNP = ConstantArray[0, 361];
nA = ConstantArray[0, 361];
nB = ConstantArray[0, 361];

(* Detector test function *)

test[angle_, e_, λ_] := Module[{c, out},
  c = (-1) ^spin2 Cos[spin2 (angle - e)];
  If[λ ≥ Abs[c], out = 0, out = Sign[c]];
  out]

(* Generate particle data  *)

Do[
 eVector = RandomReal[{0, 2 π}];
 λ = 1 / 2 Sin[RandomReal[{0, π / 2}]] ^2;
 eLeft = RandomReal[{0, 2 π}];
 eRight = eLeft + 2 π spin;
 aliceAngle = RandomReal[{0, 2 π}];
 aliceDeg[[i]] = aliceAngle / Degree;
 bobAngle = RandomReal[{0, 2 π}];
 bobDeg[[i]] = bobAngle / Degree;
 aliceDet[[i]] = test[aliceAngle, eLeft, λ];
 bobDet[[i]] = test[bobAngle, eRight, λ],
 {i, trials}]


(* statistical analysis of particle data  *)
```

```
Do[
 θ = Ceiling[Abs[(aliceDeg[[i]] - bobDeg[[i]])]];
 aliceD = aliceDet[[i]]; bobD = bobDet[[i]];
 If[aliceD == 1, nA[[θ]]++];
 If[bobD == 1, nB[[θ]]++];
 If[aliceD == 1 && bobD == 1, nPP[[θ]]++];
 If[aliceD == 1 && bobD == -1, nPN[[θ]]++];
 If[aliceD == -1 && bobD == 1, nNP[[θ]]++];
 If[aliceD == -1 && bobD == -1, nNN[[θ]]++],
 {i, trials}]

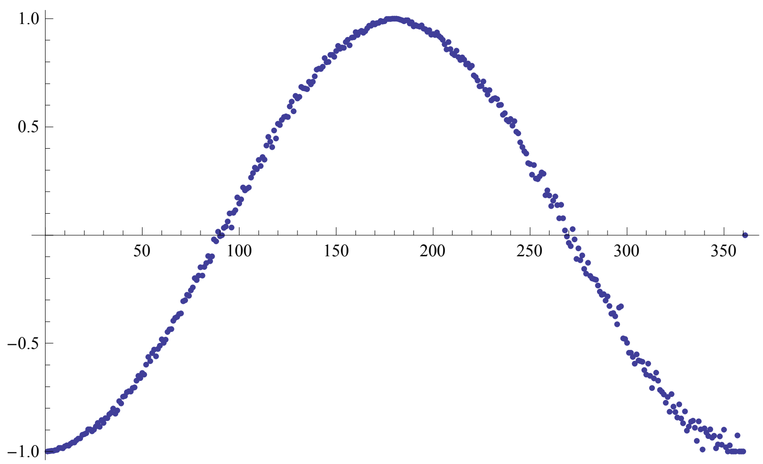
(* Calculate mean values and plot *)

pPP = 0; pPN = 0; pNP = 0; pNN = 0;

mean = ConstantArray[0, 361];

Do[
 sum = nPP[[i]] + nPN[[i]] + nNP[[i]] + nNN[[i]];
If[sum == 0, Goto[jump],
  {pPP = nPP[[i]] / sum;
   pNP = nNP[[i]] / sum;
   pPN = nPN[[i]] / sum;
   pNN = nNN[[i]] / sum;
mean[[i]] = pPP + pNN - pPN - pNP}];
 Label[jump],
 {i, 361}]


simulation = ListPlot[mean]
```

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(mean[[24]] + mean[[23]]) / 2 // N
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```
-0.901815
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(mean[[68]] + mean[[69]]) / 2 // N
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```
-0.371755
```

```
cos = Plot[-Cos[x Degree], {x, 0, 360}, PlotStyle → {Red, Thick}];

(* Compare mean values with Cosine
 the Cosine curve is off by one degree compared to simulation *)

Show[simulation, cos]
```