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```
function beta = rsp_alpha(chi_expt)

if chi_expt~=chi_expt'
    error('Input matrix is not a density matrix.')
else
    chi_expt=chi_expt/trace(chi_expt);
end
```

```
Not enough input arguments.

Error in rsp_beta (line 2)
if chi_expt~=chi_expt'
```

define SDP parameters

define v_λ and ρ_λ

```
for i = 1:2
for j = 1:2
for k = 1:2

    v{i,j,k} = [i,j,k];
       rho_lambda{i,j,k} = sdpvar(2,2,'hermitian','complex');

end
end
end
```

define $p(v_{nm}|\lambda)$

```
for n=1:2
```

```
for m=1:3
for i=1:2
for j=1:2
for k=1:2
  P_lambda_vnm{i,j,k,n,m} = kronDel(n,v{i,j,k}(m));
end
end
end
end
end
```

define $\tilde{\rho}_{c|v_{nm}} = \sum_\lambda p(\lambda|v_{nm})\rho_\lambda$

```
for n=1:2
for m=1:3
  rho_rcs{n,m} = 0*sdpvar(2,2);
for i=1:2
for j=1:2
for k=1:2
  rho_rcs{n,m} = rho_rcs{n,m} +
 P_lambda_vnm{i,j,k,n,m}*rho_lambda{i,j,k};
end
end
end
end
end
```

construct $\tilde{\chi}_{\mathcal{E}_c}$

```
for i=1:2
for j=1:2

    rhoc{i,j}=0*sdpvar(2,2);

end
end


rhoc{1,1}=rho_rcs{1,3};
rhoc{1,2}=rho_rcs{1,1}+sqrt(-1)*rho_rcs{1,2}-
(1+sqrt(-1))*(rho_rcs{1,3}+rho_rcs{2,3})/2;
rhoc{2,1}=rho_rcs{1,1}-sqrt(-1)*rho_rcs{1,2}-(1-
sqrt(-1))*(rho_rcs{1,3}+rho_rcs{2,3})/2;
rhoc{2,2}=rho_rcs{2,3};


for i=1:2
    for j=1:2
        for k=1:2
            for l=1:2
                chi_Ec(i*2+j*1-2,k*2+l*1-2)=rhoc{i,k}(j,l);
            end
         end
```

```
        end
    end
```

constraits

```
F = [];
```

$\tilde{\rho}_\lambda \geq 0, \forall\lambda$

```
for i = 1:2
for j = 1:2
for k = 1:2
      F = [F, rho_lambda{i,j,k}>=0];
end
end
end
```

$\tilde{\chi}_{\mathcal{E}_c} \geq 0$

```
F = [F, chi_Ec >= 0];
```

$\mathrm{tr}(\tilde{\rho}_{c|v_{0m}}) = \mathrm{tr}(\tilde{\rho}_{c|v_{1m}}), \quad \forall m$

```
F =
 [F,trace(rho_lambda{1,1,1}+rho_lambda{1,1,2}+rho_lambda{1,2,1}+rho_lambda{1,2,2})
F =
 [F,trace(rho_lambda{1,1,1}+rho_lambda{1,1,2}+rho_lambda{2,1,1}+rho_lambda{2,1,2})
F =
 [F,trace(rho_lambda{1,1,1}+rho_lambda{1,2,1}+rho_lambda{2,1,1}+rho_lambda{2,2,1})
```

$\tilde{\chi}_{\mathcal{E}_c} - \chi_{\mathcal{E}} \geq 0$

```
Fb_expt=[F , chi_Ec-chi_expt >= 0];
```

$\mathrm{tr}(\tilde{\chi}_{\mathcal{E}_c}) \geq 1$

```
Fb_expt=[Fb_expt , trace(chi_Ec) >= 1];
```

minimize $\beta \equiv \min_{\tilde{\chi}_{\mathcal{E}_c}} \quad \mathrm{tr}(\tilde{\chi}_{\mathcal{E}_c}) - 1$ via SDP solver

```
sums=0*sdpvar(1,1);
sums=trace(chi_Ec)-1;
sol=solvesdp(Fb_expt ,sums)

beta=double(sums);
```

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