OneLoop.m

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Abstract

Short intructions on how to use the package `OneLoop.m`. They are just the comments included in the package.

```
############################################################
#Program: OneLoop.m                                        #
#Version: 1.6                                              #
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############################################################


This program calculates ALL the scalar one-loop integrals and ALL the
tensor one-loop integrals up to 4 Lorentz indexes( it can easily be
extended). It also calculates the Divergent part of those integrals.
Conventions are from the appendix C to my book "Advanced Quantum
Field Theory"
(http://porthos.ist.utl.pt/ftp/textos/tca.pdf)
and are as follows:

1) A factor of i/(16 \pi^2) is taken out from all the results. It
   should be put by hand in the end of the calculation. This is also
   the ususal convention with the Passarino Veltman integrals.

2) To get the scalar integrals one uses the command:

   ExpandScalarIntegral[r,m]

   where m=number of denominators, r=power of k^2 in the numerator.


3) To get the tensor integrals one uses the command

   ExpandTensorIntegral[m,mu,nu,...]

   where m=number of denominators, and mu, nu, ... are the indices of
   the momenta k^{\mu}, k^{\nu}, ... in the numerator. At the moment
   are only defined the integrals up to 4 Lorentz Indices.

4) In the results

   delta= 2/\epsilon -\gamma +ln 4\pi

   CC= (\sum_{i=1}{^m-1} x_i r_i)^2 + \sum_{i=1}{^m-1} x_i m_1^2
       -\sum_{i=1}{^m-1} x_i r_i^2 + (1- \sum_{i=1}{^m-1} x_i) m_m^2

5) The for vector P^{\mu} is defined in the appendix of my book for
the different cases.
```

6) The integration in the Feynman parameters still has to be done. For more then 3 denominators it is best to uese the Passarino -Veltman integrals (see the Appendix C of my book)

where m_i are the masses, r_i the momenta (see appendix) and x_i the Feynman parameters. To get a final answer the integration in the Feynman parameters has still to be done.

7) To get the divergent part we use the following commands:

```
TadpoleDiv[0], TadpoleDiv[a], TadpoleDiv[a,b] ...
SelfDiv[0], SelfDiv[a], SelfDiv[a,b] ...
TriangleDiv[0], TriangleDiv[a], TriangleDiv[a,b] ...
BoxDiv[a,b,c,d]
```