FeynRules 2012 Workshop
Summary talk

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Food

- **The first** FEYNRULES **2010 challenge**: *Bouchées* vs. *croustades*?

- **Properties**.
    * Are they (anti)commuting?
    * Are they the same?
- **This year: no new cooking challenge, but a drinking one...**

Geographical localization.

- **Locating ourselves in the Vosgian mountains**.

* FeynRules 2010: required a **GPS**.
* **Precision:** $\mathcal{O}(1000\mathbf{km}).$

Geographical localization.

- **Locating ourselves in the Vosgian mountains**.

* FeynRules 2012: **no more GPS**.
* **Precision reached: NLO-accuracy at least!**

Geographical localization.

- **Locating ourselves in the Vosgian mountains**.

  * The hike was a **O(10) km loop**.
  * **New tools for loops are better.**
  * **Check the smiles...**
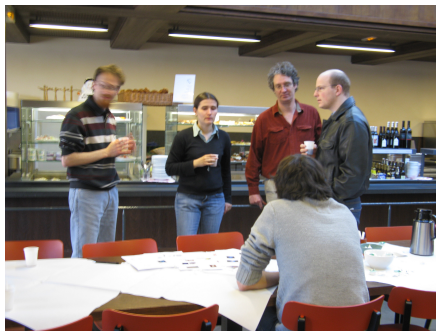
Intensive development of new algorithms.

- **Deep thoughts...**

  *   About how **pronouncing (in English)** first-names.

Intensive development of new algorithms.

- **Faster-than-light people...**

  * And **not massless**!
  * **Dirac or Majorana**?

Intensive development of new algorithms.

- **Lectures...**

- * Please look carefully: **another faster-than-light guy**...
- * Maybe some lectures on acronyms are necessary
  (**'ass' is not a good acronym!**)

Back to neutrinos.

- **Now we know the reason of the signal...**

* **Cosmography is everything**.

We will make it!

Outline.

1. **Towards NLO.**

2. Supersymmetry.

3. Web-based tools.

4. Other tools and developments.

5. The final words

Towards automated NLO.

1. **UV counterterms**.

2. R_2 **counterterms**.

3. FEYNARTS **interface**.

4. UFO **@ NLO**.

People: BF, Céline, Claude, Olivier, Rik, Thomas, Valentin.

FEYNRULES@ NLO.

● **Generalization of the** FEYNARTS **interface**:

  * Generic counterterms are now **included**.
  * **New version of** FEYNARTS/FORMCALC.
    ⇒ Analytic computation of the renormalization constants **for free**.
    ⇒ **On-going**…
    ⇒ **To be validated**.
    ⇒ Time-line: **this summer**.

● **Automated computation of the** R_2 **counterterms**:

  * **The Standard Model is basically there**.
  * Next-to-leading step: **validation of the Standard Model** (4-points).
  * Next-to-next-to-leading step: **The MSSM**.
  * Need for an **independent implementation** for the validation.
    (⇒ Cross check with Hua-Sheng's results).
  * Time-line: **this summer**.

UFO @ NLO.

- **Second internal draft with the conventions**.
  - * Will serve as a basis for the **update of the** UFO **interface**.
  - * Will be developed as soon as **all the building blocks (from** FEYNRULES**) will be there**.

- **Other ideas which might be interesting**:
  - * **Loop Feynman rules**.
  - * **Speed issues**.

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Supersymmetric extensions.

1 **Towards a spectrum generator generator**.

2 **Mass matrices and automated diagonalization**.

3 SUSPECT **interface**.

4 **Spin 3/2**.

5 **A supergravity module**.

People: Adam, BF, Karen, Michael, Michel, Neil, Olivier.

ASS: automated supersymmetric spectra.

[Please change the acronym]

- **First module: RGE.**
  - * **Automated derivation of the SUSY-RGE** @ the two-loop level.
  - * **Superpotential, gauge and gaugino RGEs**: validated.
  - * **Soft scalar masses and interactions:** on-going.
  - * Time-line: **this summer/fall**.

- **Second module: automated diagonalization of the mass matrices.**
  - * **Beyond SUSY:** handling any model.
  - * **Tree-level**: done.
  - * **Loop-level**: starting.
  - * Time-line: **this summer/fall**.

- **Interface: a $C++$ glue.**
  - * **Handling external parameters**.
  - * **Solving** the RGEs.
  - * **Diagonalizing** the spectrum.
  - * **Producing** the SLHA card.
  - * Time-line: **this fall**.

More SUSY developments.

- **The SuSpect interface**.
  - * SuSpect 3 is becoming more and more **generic**.
  - * **Building blocks** (RGEs, mass matrices) to be extracted from FeynRules.
  - * Time-line: **this year**.

- **Spin 3/2.**
  - * **Problems at the** FeynRules/UFO/ALOHA/MadGraph **5 level**...
    ⇒ on-going debugging...
  - * **Full validation**: on the FeynRules web-validation platform.
  - * Time-line: **very soon**.

- **Supergravity @ FeynRules**.
  - * **Module to extract automatically any sugra Lagrangian**.
  - * For any types of constraints.
  - * **Curved superspace** implementation on-going.

Outline.

FEYNRULES on the web.

1. FEYNRULES **validation platform**.

2. **The GUI interface.**

   People: Neil, Nicholas, Olivier.

FEYNRULES tools on the web.

- **The web validation platform.**
  - * **The web-validation platform of** FEYNRULES **is now public.**
    `http://feynrules.irmp.ucl.ac.be/validation`
  - * Implementation of the spin 3/2 **on-going**.
  - * Efforts to keep MADGRAPH **and** CALCHEP up-to-date on the platform.

- **Model building platform.**
  - * **Improvement** for the storage of implemented models (XML).
  - * Refinements for the **core code**.
  - * Specifications of the GUI **format**.

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Other tools and developments.

① **Multifermion interactions.**

② **Decay package.**

③ MADANALYSIS 5.

④ USRMOD.

People: BF, Céline, Claude, Eric, Olivier, Rik, Thomas.

Other tools and developments.

- **Multifermion interactions.**
  - * **Conventions (**FeynArts, FeynRules, MadGraph, UFO**) fixed.**
  - * Implementation: **on-going**.

- **Decay package.**
  - * **Automated** computation of the $1 \to 2$ decays in FeynRules: 75% done.
  - * To be **exported** to the UFO.
  - * Possible **extension** of the UFO format.

- MadAnalysis **5.**
  - * Embedding in MadGraph and official release: **end of April**.
  - * **Common developments** with MadGraph.
  - * Development of the validation plots related to the **matching** procedure.

- UsrMod
  - * **Duplication of particles** ($Z \to Z'$, importing particles across models).
  - * Direct update of the **LH-parameters**.
  - * Easy inclusion of **new particles from scratch**.
  - * Automated **update of the** UFO: done.

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Summary

- **A lot of projects have started/gone on.**
  - * NLO.
  - * SUSY.
  - * Web platforms.
  - * Other tools for phenomenology.

- **This was a very productive workshop.**

- **Next Sainte-Odile workshop.**
  - * In two years?
  - * Other proposals?
  - * Elsewhere?

Thanks

- **Thanks to all of you for coming.**

- **Thanks to the (not present) organizers.**
  - * Leila Seifert (CMS Strasbourg).
  - * Nicolas Rudolff (IT department in Strasbourg).
  - * Renate Bousquet and all the monastery people.

- **Special thanks.**
  - * Eric (EVO master).
  - * Michel (Driving us here).

- **Thanks to the IPHC lab for support.**

The 'official' picture

Thanks again for coming!