Chapter 1

Showcase of eIris Inductive

- Explain that we will show an example of the new iInductive system
- First we define the inductive and show the created lemma's and definitions
- Next we use the induction schema in our new tactic to proof a lemma

1.1 Defining a new inductive

- Able to use standard Coq inductive syntax
- Show example
- Show fix-point and explain
- Show other Lemmas and explain as well

1.2 Proving a lemma using the inductive

- Explain Lemma we will prove
- Show steps of proof

```
Lemma ind_{test_1}(q q' : Qp) (v : val) :
        is_list q v * is_list q' v *-* is_list (q+q') v.
2
   Proof.
3
        iSplit.
4
        eiIntros "[Hq Hq']".
5
        iRevert "Hq'".
6
        eiInduction "Hq" as "[IH | (%l' & %v' & %tl' & Hl' & IH & %Hy)]"; ei
7
        + iApply is_list_unfold_2.
8
            iLeft.
9
            iFrame.
10
        + simplify_eq.
            iApply is_list_unfold_2.
12
            iRight.
13
            iExists l', v', tl'.
14
            eiDestruct "Hq'" as "[%Hl | (%l'' & %v'' & %tl'' & Hl & Hilq' & 9
15
            iCombine "Hl' Hl" as "Hl" gives %[_ ?]; simplify_eq.
16
            iFrame.
17
            iDestruct "IH" as "[IH _]".
18
            iSplitL.
19
            * iApply ("IH" with "[$]").
20
            * by iPureIntro.
21
        eiIntros "Hi".
22
        eiInduction "Hi" as "[%Ha | (%l & %v' & %tl & [Hq Hq'] & [[Hiq Hiq']
23
        + simplify_eq.
24
            iSplitL.
25
            * iApply is_list_unfold.
26
            iLeft.
27
            by iPureIntro.
            * iApply is_list_unfold.
29
            iLeft.
30
            by iPureIntro.
31
        + iSplitL "Hq Hiq".
32
            * iApply is_list_unfold.
33
            iRight.
34
            iExists l, v', tl.
            iFrame.
36
            by iPureIntro.
37
            * iApply is_list_unfold.
38
            iRight.
39
            iExists l, v', tl.
40
            iFrame.
41
            by iPureIntro.
42
   Qed.
```

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