

infix

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SUMMARY

The contribution includes some functions implementing the continuous subsequence relation in the Mathcomp **type seq**.

WHAT IS ALL THIS ABOUT?

Coq is a digital formal proof assistant. Its goal is to ensure the logic correctness in mathematical proofs, thus being an ideal environment for certifying whether an algorithm fulfills some desired properties. **Mathcomp** is a general-purpose mathematics library of Coq.

WHAT DOES INFIX MEAN?

In the common mathematical mindset, a sequence is an ordered (or more generally, indexed) list. Given a pair of sequences S, Q , we say that Q is a **subsequence** of S if all the elements of Q appear in S in the same order. The infix relation would **preserve contiguity** in addition to order.

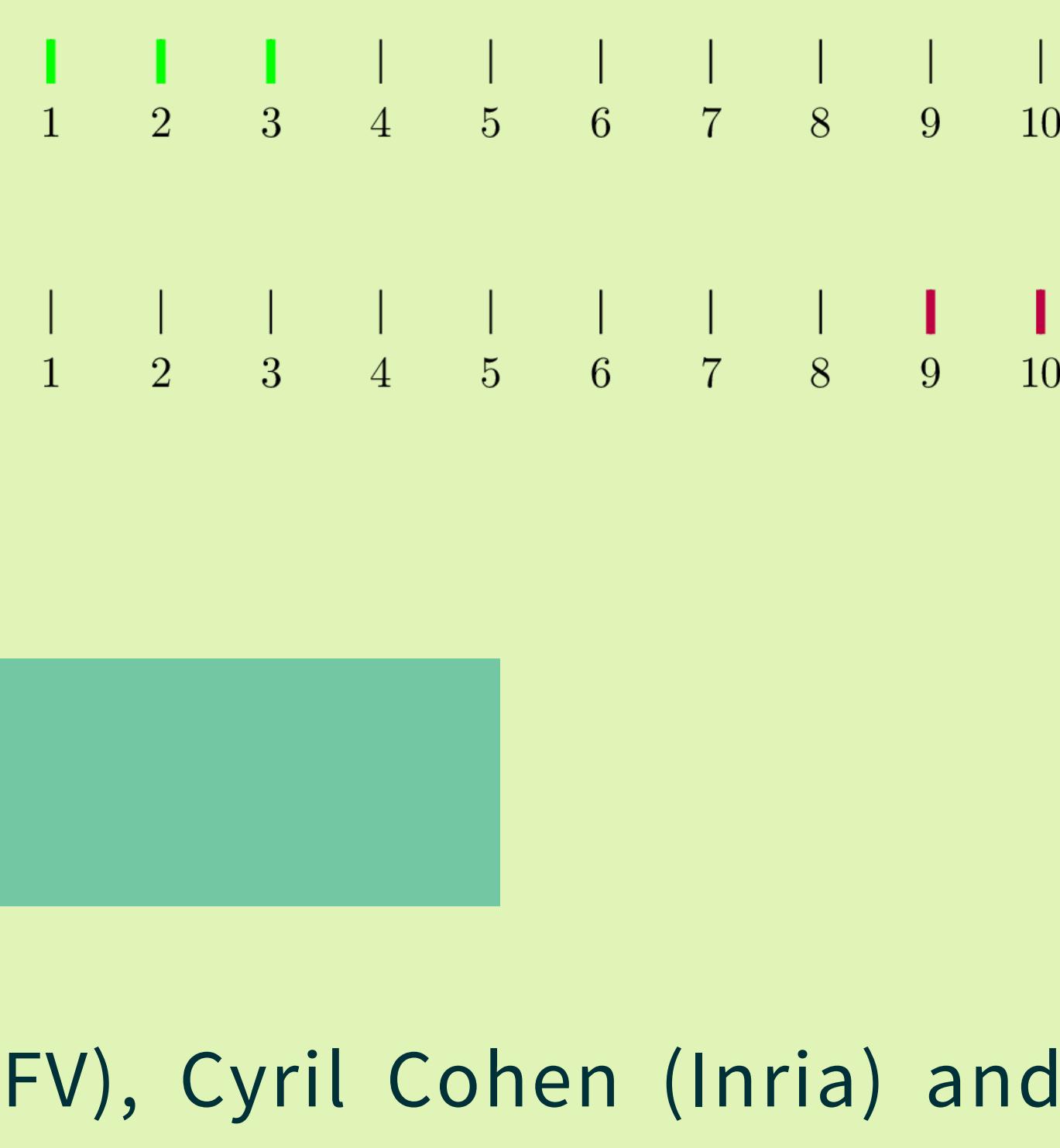
WHY COULD IT BE IMPORTANT?

Seeing the sequence as an ordered set its infixes are exactly the intervals. Arithmetic problems such as primes in arithmetical progression work with infixes of arithmetic progressions. Furthermore, infixes take a central role in search algorithms.

INFIX, PREFIX AND SUFFIX PREDICATES

We have added the following type **seq** functions to the library:

- **infix** : $\text{seq } T \rightarrow \text{seq } T \rightarrow \text{bool}$
 - infix $s_1 s_2$ is equivalent to: There are s and s' such that $s_2 = s ++ s_1 ++ s'$. Some of its properties are reflexivity, transitivity and infix $s_1 s_2$ implies **subseq** $s_1 s_2$.
- **prefix** : $\text{seq } T \rightarrow \text{seq } T \rightarrow \text{bool}$
 - prefix $s_1 s_2$ is equivalent to: There is an s such that $s_2 = s_1 ++ s$. Again, some of its properties are reflexivity, transitivity and prefix $s_1 s_2$ implies infix $s_1 s_2$.
- **suffix** : $\text{seq } T \rightarrow \text{seq } T \rightarrow \text{bool}$
 - suffix $s_1 s_2$ is equivalent to: There is an s such that $s_2 = s ++ s_1$. Some proven properties are reflexivity, transitivity and prefix $s_1 s_2$ implies infix $s_1 s_2$.
- **infix_index** : $\text{seq } T \rightarrow \text{seq } T \rightarrow \text{nat}$
 - The **infix_index** function returns the first index at which s_1 appears in s_2 if it is its infix and $(\text{size } s_2) + 1$ otherwise (if s_2 is an empty sequence it returns 1).



REFERENCES

Eduardo Hermo (FV), Mireia González (FV), Cyril Cohen (Inria) and Christian Doczkal (Inria)
Infix section in seq.v 2022

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