

# Ravel: A MAS orchestration platform for Human-Chatbots Conversations

Maira Gatti de Bayser, Claudio Pinhanez, Heloisa Candello, Marisa Affonso Vasconcelos, Mauro Pichiliani, Melina Alberio Guerra, Paulo Cavalin, and Renan Souza

IBM Research, Brazil

## Appendix A Ravel Communication Hub Algorithms

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### Algorithm 1 Events Handling

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```
1: inbox: A queue to store incoming messages
2: function LISTENTOEVENT(event, data)
3:   if event="user join" then
4:     bots ← getAvailableBots(data.app)
5:     emitEventForEachBot(new user", data.room, bots)
6:   end if
7:   if event="user message" or "bot message" then
8:     inbox.enqueue(data.message)
9:   end if
10: end function
```

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### Algorithm 2 Calling the Conversation Governance Service

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```
1: gov: The Conversation Governance Service
2: inbox: A queue to store incoming messages
3: function CHECKINBOX(inbox)
4:   while inbox.length() > 0 do
5:     message = gov.updateConversation(inbox.dequeue())
6:     sender ← message.getSender()
7:     if sender.isAllowed() then
8:       broadcastInChatGroup(room, message)
9:     end if
10:    sleep(500)
11:   end while
12: end function
```

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## Appendix B Subset of *finch* Rules

```

{ "id": "finch", "desc": "Finch Governance",
  "roles": [ {"id": "user", "desc": "A human"},
              {"id": "bot", "desc": "a bot"},
              {"id": "mediator", "desc": "the mediator"},
              {"id": "expert", "desc": "the expert"},
              ... ],
  "speech_acts": [ {"id": "greetings", "desc": "..."},
                   {"id": "thank", "desc": "..."},
                   {"id": "query_calc", "desc": "..."},
                   {"id": "inform_calc", "desc": "..."},
                   {"id": "query_and_finish_calc", "desc": "..."},
                   ... ],
  "topics": [ {"id": "tb", "desc": "about treasure bonds"},
              {"id": "cd", "desc": "about certificate of deposit"},
              {"id": "sa", "desc": "about savings account"},
              {"id": "investment", "desc": "generic investments topics"},
              {"id": "all", "desc": "all bots are able to reply"},
              {"id": "undefined", "desc": ""}],
  "messages": [ {"id": "m1", "name_mention": true},
                 {"id": "m2",
                  "topics": ["cd"], "speech_acts": ["!query_calc"],
                  "sender_roles": ["user"]},
                 {"id": "m3",
                  "speech_acts": ["query_calc"], "sender_roles": ["user"]},
                 {"id": "m4",
                  "speech_acts": ["query_calc"],
                  "sender_roles": ["bot", "mediator"], "name_mention": true},
                 {"id": "m5",
                  "speech_acts": ["inform_calc"],
                  "sender_roles": ["bot", "expert"]},
                 {"id": "m6",
                  "speech_acts": ["query_and_finish_calc"],
                  "sender_roles": ["bot", "mediator"]},
                 ... ],
  "norms": [ {"id": "perm_to_user",
               "type": "perm", "roles": ["user"]},
              {"id": "proh_to_all_others",
               "type": "proh",
               "applies_to": ["!$sender", "!$receiver"],
               "roles": ["bot"]},
              {"id": "perm_to_sender",
               "type": "perm",
               "applies_to": ["$sender"]},
              {"id": "oblig_to_receiver",
               "type": "oblig",
               "applies_to": ["$receiver"]},
              {"id": "oblig_to_cd",
               "type": "oblig",
               "applies_to": ["cd"]} ]
}

```

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        "type": "oblig",
        "roles": ["cd"]},
    {"id": "proh_to_experts",
     "type": "proh",
     "applies_to": ["!$receiver"],
     "roles": ["bot", "expert"]},
    {"id": "proh_to_experts_except_to_inform_calc",
     "type": "proh",
     "except_messages": ["m5"],
     "roles": ["bot", "expert"]},
    {"id": "proh_to_mediator_except_to_finish_calc",
     "type": "proh",
     "except_messages": ["m6"],
     "roles": ["bot", "mediator"]},
    {"id": "proh_to_mediator",
     "type": "proh", "applies_to": ["!$receiver"],
     "roles": ["bot", "mediator"]},
    {"id": "proh_to_all_others_except_last_sender",
     "type": "proh",
     "applies_to": ["!$last_sender",
                    "!$receiver",
                    "!$sender"],
     "roles": ["bot"]},
    .... ],
"protocol": {
  "states": [
    {"id": "sNormOff", "desc": "Norms Off"},
    {"id": "sNormOn", "desc": "Norms On"},
    "norms": [ {"id": "oblig_to_mediator",
                 "event": "norm activation"},
               {"id": "proh_to_experts",
                 "event": "norm activation"},
               {"id": "perm_to_sender",
                 "event": "norm activation"},
               {"id": "perm_to_user",
                 "event": "norm activation"}]
  ],
"transitions": [
  {"id": "t0", "from": "sNormOn", "to": "sNormOn",
   "messages": ["m1"],
   "norms": [
     {"id": "proh_to_experts_except_to_inform_calc",
      "event": "norm deactivation"},
     {"id": "proh_to_experts",
      "event": "norm deactivation"},
     {"id": "proh_to_mediator",
      "event": "norm deactivation"},
     {"id": "proh_to_all_others_except_last_sender",
      "event": "norm deactivation"},
     {"id": "oblig_to_last_sender",
      "event": "norm deactivation"}
   ]
  ]
}

```

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    {"id": "oblig_to_receiver",
     "event": "norm activation"},
    {"id": "proh_to_all_others",
     "event": "norm activation"},
    {"id": "perm_to_sender",
     "event": "norm activation"}]},
{"id": "t1", "from": "sNormOn", "to": "sNormOn",
 "messages": ["m3"],
 "norms": [
  {"id": "proh_to_all_others",
   "event": "norm deactivation"},
  {"id": "proh_to_mediator",
   "event": "norm deactivation"},
  {"id": "proh_to_experts_except_to_inform_calc",
   "event": "norm deactivation"},
  {"id": "proh_to_all_others_except_last_sender",
   "event": "norm deactivation"},
  {"id": "oblig_to_last_sender",
   "event": "norm deactivation"},
  {"id": "proh_to_mediator_except_to_finish_calc",
   "event": "norm deactivation"},
  {"id": "oblig_to_mediator",
   "event": "norm activation"},
  {"id": "proh_to_experts",
   "event": "norm activation"},
  {"id": "perm_to_sender",
   "event": "norm activation"}]},
{"id": "t2", "from": "sNormOn", "to": "sNormOn",
 "messages": ["m4"],
 "norms": [
  {"id": "proh_to_all_others_except_last_sender",
   "event": "norm deactivation"},
  {"id": "oblig_to_last_sender",
   "event": "norm deactivation"},
  {"id": "proh_to_all_others",
   "event": "norm deactivation"},
  {"id": "proh_to_experts",
   "event": "norm deactivation"},
  {"id": "oblig_to_mediator",
   "event": "norm deactivation"},
  {"id": "oblig_to_receiver",
   "event": "norm activation"},
  {"id": "perm_to_sender",
   "event": "norm activation"},
  {"id": "proh_to_experts_except_to_inform_calc",
   "event": "norm activation"},
  {"id": "proh_to_mediator_except_to_finish_calc",
   "event": "norm activation"}]},
{"id": "t3", "from": "sNormOn", "to": "sNormOn",
 "messages": ["m5"],

```

```

    "norms": [
      {"id": "proh_to_all_others_except_last_sender",
       "event": "norm deactivation"},
      {"id": "proh_to_experts_except_to_inform_calc",
       "event": "norm deactivation"},
      {"id": "oblig_to_last_sender",
       "event": "norm deactivation"},
      {"id": "proh_to_all_others",
       "event": "norm deactivation"},
      {"id": "oblig_to_mediator",
       "event": "norm deactivation"},
      {"id": "oblig_to_receiver",
       "event": "norm deactivation"},
      {"id": "perm_to_sender",
       "event": "norm deactivation"},
      {"id": "perm_to_user",
       "event": "norm activation"},
      {"id": "proh_to_experts",
       "event": "norm activation"},
      {"id": "proh_to_mediator_except_to_finish_calc",
       "event": "norm activation"}]},
    {"id": "t4", "from": "sNormOn", "to": "sNormOn",
     "messages": ["m6"],
     "norms": [
       {"id": "proh_to_mediator",
        "event": "norm deactivation"},
       {"id": "oblig_to_mediator",
        "event": "norm deactivation"},
       {"id": "proh_to_all_others_except_last_sender",
        "event": "norm deactivation"},
       {"id": "oblig_to_last_sender",
        "event": "norm deactivation"},
       {"id": "proh_to_experts_except_to_inform_calc",
        "event": "norm deactivation"},
       {"id": "proh_to_mediator_except_to_finish_calc",
        "event": "norm deactivation"},
       {"id": "proh_to_experts",
        "event": "norm activation"},
       {"id": "oblig_to_receiver",
        "event": "norm deactivation"}]},
    ...

```

```

  ]}]

```